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EVALUATION OF THE TECHNICAL PROVISIONS OF INSURANCE CONTRACTS UNDER IFRS 17

MARIA CARLOTA GONÇALVES PORTO CRUZ

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Abstract

The implementation of IFRS 17 on the first of January 2022 brings one of the biggest challenges recently being faced by insurers. The understanding of the upcoming changes and their impact on the insurance sector became a global market concern, subjected to extensive discussion and investigation.

Due to its international relevance, IFRS 17 is set-up on a principles-based framework. However, this raises some uncertainty in safeguarding the level-playing field that is aimed. In fact, the subjectivity underlying some key components for the measurement of insurance contracts, such as the discount rates and the risk adjustment for non-financial risk, may be the cause of heterogeneity within insurance reporting.

Motivated by the environment of concern that underlies IFRS 17, the present report aims to assess its requirements within the evaluation of technical provisions of insurance contracts, while understanding possible large macro impacts that its adoption implies. It further comprises a discussion on the likelihood of the regime to satisfy its intended goals, including the transparency, comparability and consistency of insurance reporting. This is the outcome of the six-month curricular internship at Autoridade de Supervisão de Seguros e Fundos de Pensões.

Keywords: IFRS 17, Discount Rates, Illiquidity Adjustment, Risk Adjustment, Contractual Service Margin.

Sumário

A adoção da IFRS 17 a um de Janeiro de 2022 introduz um dos maiores desafios recentemente enfrentados pelas empresas de seguros. A compreensão das mudanças inerentes à sua introdução, bem como os possíveis impactos no mercado segurador, tornou-se preocupação geral do mercado, alvo de intensa discussão e investigação.

Devido ao seu cariz internacional, a IFRS 17 é desenvolvida num contexto de requisitos não prescritivos, baseado em princípios. No entanto, a sua natureza levanta algumas questões na salvaguarda do *level-playing field* que é desejado. A subjetividade implícita em componentes chave para a mensuração de contratos de seguros, tal como as taxas de desconto e o *risk adjustment for non-financial risk*, pode ser motivo de heterogeneidade no seio do reporte financeiro.

Motivado pelo ambiente de incerteza inerente à adoção do IFRS 17, o presente relatório procura mitigar alguns dos requisitos subjacentes à avaliação das provisões técnicas de contractos de seguros. Adicionalmente, compreende uma discussão ao nível do alcance dos seus principais objetivos, incluindo a transparência, comparabilidade e consistência do reporte financeiro de contractos de seguro. Este relatório é o resultado da investigação realizada ao longo de seis meses no âmbito de um estágio curricular na Autoridade de Supervisão de Seguros e Fundos de Pensões.

Palavras-chave[1]**:** IFRS 17, Taxas de Desconto, Illiquidity Adjustment, Risk Adjustment, Contractual Service Margin.

[1] Devido à inexistência de uma tradução oficial da norma contabilística são utilizadas as expressões originais do IFRS 17.

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Acronyms and Abbreviations

ASF	Autoridade de Supervisão de Seguros e Fundos de Pensões
AU	Australia
BE	Best Estimate
BU	Bottom-up Approach
CDS	Credit Default Swaps
CSM	Contractual Service Margin
DRS	Risk Analysis and Solvency Department
EIOPA	European Insurance and Occupational Pensions Authority
EU	European Union
GMM	General Measurement Model
IA	Illiquidity Adjustment
IAS	International Accounting Standards
IASB	International Accounting Standards Board
IFRS	International Financial Reporting Standard
JP	Japan
LLP	Last Liquid Point
LRC	Liability of Remaining Coverage
MA	Matching Adjustment
P&L	Profit and Loss Statement
PAA	Premium Allocation Approach
PCES	Plano de Contas para as Empresas de Seguros
PT	Portugal
RA	Risk Adjustment
SCR	Solvency Capital Requirement
TD	Top-down Approach
TVaR	Tail Value at Risk
UFR	Ultimate Forward Rate
US	United States (of America)
VA	Volatility Adjustment
VaR	Value at Risk
VFA	Variable Fee Approach

1. Introduction

The following report is the result of a six-month internship at Autoridade de Supervisão de Seguros e Fundos de Pensões (ASF), undertaken within its the Risk Analysis and Solvency Department (DRS). It aims to evaluate the technical provisions of insurance contracts under the International Financial Reporting Standard (IFRS) 17, as well as testing some of its main features and objectives

DRS is involved in the oversight of the Portuguese insurance and pensions fund market, mostly through risk analysis at a macroprudential level, targeting the financial stability of the sector, and assessing regulatory developments susceptible of producing relevant impacts. Thus, the approach to the adoption of a new accounting regime, IFRS 17, is currently an important concern.

IFRS 17 is the latest International Financial Reporting Standard set by the International Accounting Standards Board (IASB). First published in May of 2017, is the outcome of the second, and final, phase of a project started in 1997. Phase I was concluded in March 2004, with the issuing of IFRS 4, an interim standard.

The need for splitting this project in two separate stages is justified by the fact that in 2005, year in which a significant number of countries adopted IFRS standards, the final version of the reporting standard for insurance contracts would not be finalized. This was the case of several European Union (EU) member states that, as a result of the approval of Regulation (CE) 1606/2002, of the European Parliament and of the Council of 19 July 2002, were forced to adjust their legal framework relevant to all publicly traded companies in order to accommodate the new international requirements.

Despite not being mandatory at a national level, the approach followed by ASF was to comply with the European developments. Thus, IFRS standards were integrated in the national accounting framework for insurance companies, which is set by the *Plano de Contas para as Empresas de Seguros* (PCES) since 1994. Subsequently, a new PCES was approved trough the Norma Regulamentar nº 4/2007, of 27 April 2007, enforcing the national adoption of the international accounting standards, however, with the exception of IFRS 4. The reason for this exclusion comes from its transitory nature, not allowing the stable measurement of insurance contracts in matters such as the evaluation of the technical provisions, which is fundamental for the entities' business and its supervision.

Portugal was not the only jurisdiction which excluded IFRS 4 principles. As a result, a wide range of different accounting practices were present within the insurance activity, which prevented the comparability goals targeted by the international standards. Notwithstanding, IFRS 4 was always intended to be replaced and IFRS 17 comes as the final result of this project.

Given the present transition period towards it's the effective implementation, programmed for the first of January 2022, the understanding of the upcoming changes is fundamental to the insurance business. In fact, the new standard will bring one of the biggest challenges recently faced by insurers, due to the complexity of some of its requirements along with its underlying subjectivity.

Since this research was developed within a supervisory authority, its objective focuses on larger scale macro impacts and concerns, rather than on overcoming customized implementation steps at the company level. Therefore, insights were sought after on its most prominent aspects, including the evaluation of the likelihood of the requirements to satisfy the standard's intended goals.

In order to first understand the objectives of IFRS 17, and the context in which it is being introduced, its strategic targets are explored, alongside with its comparison to the currently in force Portuguese accounting regime. Some potential contact points with the prudential regime - Solvency II – were

investigated as well, but mostly on a technical and theoretical perspective, since these are complementary regimes, rather than alternatives to each other. This type of analysis becomes important in order to comprehend the changes that are expected to be faced once the new standard is adopted.

The subsequent chapters become more granular. On the third chapter, insights are provided on the requirements and possible estimation techniques for both discount rates and the risk adjustment for non-financial risks. It is further discussed if the principles-based setup underlying these adjustments is able to satisfy the comparability goals of the standard.

For the risk adjustment the analysis is kept on theoretical grounds, whereas the estimation of discount rates becomes more practical. In fact, solutions are searched for the construction of yield curves, which is uncommon within the relevant bibliography, where most of the examples assume discrete interest rates. This simplification likely corresponds to underestimating a critical source of heterogeneity, potentially distorted comparability and level-playing field. In this sense, a range of possible solutions are explored, all plausible within the guidance of IFRS 17, with an understanding of the impact this may have on the discounting of insurers' liabilities.

Additionally, both analyses are completed with a discussion on the possibility of benefiting from the exposure to Solvency II techniques when implementing IFRS 17. In fact, taking advantage of these may not only reduce the implementation costs, due to the usage of already embedded systems, but also, for the readers of financial statements - including supervisors - the understanding of the entity's own assessment of these components may be facilitated. The importance of identifying these synergies is highlighted given that the present assessment is developed within DRS, a team which also works very closely with the prudential regime.

According to the nature of insurance contracts, IFRS 17 provides three approaches for their measurement, including the General Measurement Model, where most long-term contracts are included, and two alternatives to this. One is the Premium Allocation Approach, which may be applied for shorter-term contracts if they do not imply considerable variability in the expected present value of future cash flows. Alternatively, the measurement of contracts with direct participation feature falls within the Variable Fee Approach.

With the aim of understanding how the reporting figures are ascertain and if these are able to provide information of relevance to the readers of financial statements, the last chapter focuses on accounting principles of IFRS 17. In this context, the same group of insurance contracts is carried along the chapter with due revisions in its assumptions and the requirements under the General Measurement Model and the Premium Allocation Approach are discussed. Given the accounting differences between the two, an assessment is developed on how distinctive measurements of the same insurance product, only varying that one entity renounced the right to end the contract while the other didn't, may reflect on the corresponding financial statements. From the results obtained, a discussion is developed on IFRS 17 contract boundaries and their impact on the selection of the accounting model. Given the specific nature of the Variable Fee Approach this is left out from the present assessment.

Overall, and in the perspective of a Master's Final Work, the discussion of IFRS 17 represents the combination between applying the theoretical knowledge acquired during the master and an anticipation of the market's needs. In fact, a deep understanding of this new standard will be required from actuaries in the upcoming years. Thus, it is particularly beneficial to be firstly introduced to this standard within a team with a growing concern towards its implementation and with a profound knowledge of the Portuguese insurance market.

2. Evolution of the Accounting and Prudential Regimes

2.1. Strategic targets of IFRS 17

IFRS 17 aims to overcome some challenges imposed by the previous accounting regime, IFRS 4. In fact, the latter, being an interim standard, allowed for a variety of different accounting practices across jurisdictions, which made it difficult for investors and analysts to understand and compare insurers' results[2]. Consequently IFRS 17 is developed on the basis of providing useful information within the financial statements and ensuring consistent reporting of insurance contracts.

IFRS 17 provides requirements exclusively for the measurement of the insurance components of contracts, meaning those that include significant transfer of insurance risk. Other standards are applicable for the non-insurance components such as embedded derivatives or goods and non-insurance services, where IFRS 9 and IFRS 15 must be applied, respectively. The need of assigning the accounting of insurance contracts to a new standard, rather than applying existing ones, emerges from the nature of these contracts, which include high volatility of outcomes and comprise significant investment components. In order to provide information of relevance to the users of financial statements on all types of insurance contracts, IASB recognizes the importance of establishing a new standard which would take into account the individual characteristics the insurance business.

The new standard provides some scope for individual assessment, favoring the entity's own expert judgment. Moreover, it is to be adopted in over 120 countries, with different economic backgrounds and a variety of business profiles. Thus, IFRS 17 is a principles-based standard, as a rules-based one would hardly be able to accommodate the distinctive characteristics of the all insurance contracts within the different jurisdictions.

Overall, IFRS 17 aims to capture the complexity of insurance contracts and provide their consistent treatment, reflecting the economic substance of the insurance activity. Even if some of the requirements under the new standard, discussed further in this report, may question the comparability objectives that are aimed, the fact is that a global accounting framework, which provides a common *level-playing field*, is important on the current environment of high cross border activity, such that the competitiveness of entities is not constrained by local regulation.

2.2. Framing the developments in the accounting regime and its coexistence with Solvency II

The effective implementation date of IFRS 17 is programmed for the first of January of 2022. From the transition date onwards, besides being accommodated under the current accounting regime, PCES, it will prevail along-side with the ongoing prudential regime, Solvency II. The next two paragraphs give an overview of the influence that IFRS 17 may have on the accounting and prudential reality. Further detail on the differences and similarities between regimes is provided in the next section of this chapter.

[2] IFRS 17 Insurance Contracts, paragraph IN1

Following the decision of including the IAS/IFRS on to PCES since 2008, from January 2022 the Portuguese accounting regime for insurance companies will be adjusted in order to accommodate the requirements of IFRS 17.

Embedding IFRS 17 in PCES may generate new challenges for insurers, due to the inclusion of some principles, such as the forward-looking estimation of the technical provisions and the inclusion of the risk adjustment for non-financial risks (hereinafter RA), which differ from existing requirements. Despite the impact these may have, the revision of the current accounting practices is necessary, since some of principles underlying the national accounting framework were established in 1991, which raises the question if they still reflect the existing economic reality.

Moreover and as already mentioned, IFRS 17 will be in force simultaneously with Solvency II. This is the regulatory and supervisory framework for European insurers and reinsurers, and establishes the requirements for an economic evaluation of the balance sheet, from where the solvency ratios are computed. With the primary goal of protecting policyholders, the prudential regime safeguards that insurers have the sufficient funds to meet its obligations when these become due. Additionally, on macro perspective, while evaluating the sound financial condition of companies, ensures the smooth functioning of the insurance sector. Thus, the objectives of Solvency II diverge with the ones underlying IFRS 17, as this provides the requirements for the measurement of insurance contracts for statutory accounting purposes and from where profits and losses or dividend distributions may be determined.

Despite the differences between the two regimes, some principles underlying the measurement of technical provisions appear fairly consistent. Given the challenges that European insurers faced on the implementation of Solvency II, in 2016, similarities between the two may help in the understanding of IFRS 17, and decrease the effort of implementing it. Consequently, in the next section, the analysis of the differences and similarities between these two regimes is developed.

2.3. Detailed comparison between IFRS 17, PCES and Solvency II

2.3.1. Comparison of key features relevant to measure technical provisions

For regulatory purposes it is crucial to define some key features of insurance contracts, so that the general evaluation of the insurers' liabilities, which involves significant amount of uncertainty, can be performed with a certain level of consistency. Some features identified by IFRS 17 are transversal to the ones already considered under PCES and Solvency II, even if with different specifications, as it will be explored in the following paragraphs.

On a first moment, a comparison is made between the requirements for the aggregation of insurance contracts. Since this topic is no longer addressed in future chapters, a more extensive understanding is provided. For the remaining ones, including contracts boundaries, estimates of cash flows, discount rates and the RA, only an overview is presented, as further dedicated insights are given along the report.

For simplification, the term PCES is used to refer the current accounting regime, prior to the adoption of IFRS 17. It is important to clarify that PCES is not going to be extinguished once IFRS 17 is implemented, but instead will be modified in order to reflect the new standard.

I. Aggregation of Contracts

For the measurement of insurance liabilities, the definition of groups of contracts is fundamental, as a contract by contract assessment, besides unpractical, would interfere with the recognition of the diversification benefits emerging from the issuing of multiple contracts. For this purpose IFRS 17 defines three different group levels.

On a first level, portfolios of insurance contracts (contracts subject to similar risks and managed together) must be defined. Subsequently, in order to reflect stability on the underlying economic and profitability trends, these must be aggregated in annual *cohorts,* meaning groups of contracts issued less than one year apart. Finally, on the last aggregation level, entities must define, at least, groups of onerous contracts, groups of contracts with no significant probability of becoming onerous, and groups of the remaining contracts which do not fall within the other two. This last aggregation level ensures that profit-making contracts do not offset the loss-making ones.

Meanwhile, Solvency II allows for the allocation of contracts to Lines of Business (LoB), meaning classes of life and non-life insurance products, according to the nature of the underlying risks. Furthermore, entities must ensure that the grouping of policies creates homogeneous risk groups (HRG) that appropriately reflect the risks of the individual policies included in those groups[3]. Subsequently, these requirements appear fairly consistent with the first grouping level defined on IFRS 17, as both require a risk-based assessment of contracts along with a focus on the technique used for the evaluation of provisions.

Regarding PCES the dissimilarities with IFRS 17 are more evident as the former does not impose any grouping requirements. Notwithstanding, entities currently aggregate contracts according to the type of products they issue. Thus, to the extent that these types of products correspond to contracts subject to similar risk and managed together, as defined on IFRS 17, there is a potential opportunity for leveraging on ongoing practices.

Overall, and despite some level of similarity on the first grouping level, IFRS 17 requires a further granularity for the measurement of technical provisions, introducing annual *cohorts* and groups of contracts according to its profitability, which may create some additional complexity relative to current practices.

II. Contract Boundaries

The delimitation of the time length of contracts becomes decisive on the amount of cash flows to be reported within the insurer's financial statements. Both IFRS 17 and Solvency II similarly define that a contract should be recognized as the coverage period begins. Notwithstanding, there is potential for different recognition dates as IFRS 17 includes the moment in which the first payment of the policyholder becomes due, while Solvency II defines the moment that the insurer becomes a party in the contract. However, this is constrained by the Portuguese regulation for insurance contracts, as it is not allowed for a contract to be in force before the payment date. Thus, the beginning of a contract must correspond, or be posterior, to the first payment made by policyholder, as further discussed in chapter 4[4].

Moreover, IFRS 17 and Solvency II similarly define the end of the contracts as the moment when the insurer is able to unilaterally end, or reprice, the contract. On the other hand, under PCES, contracts must be derecognized as the period for which the policyholder paid for coverage reaches its end. Consequently, differences are expected between PCES and IFRS 17 regarding some contracts, such as renewable contracts where the insurer renounces the right to end the contract, an aspect that will be further explored in this report.

III. Estimates of Future Cash Flows

In what concerns the core business of insurance companies, profits are established as the difference between the premiums received and the claims and expenses incurred. However, because entities

[3] Commission Delegated Regulation (EU) 2015/35, Article 34.

[4] Decreto-Lei n.º 72/2008 - Diário da República n.º 75/2008, Série I de 2008-04-16, article 59º

assume responsibilities regarding events that have not yet happened, different requirements on the estimates of such cash flows have an impact on the entities' reporting figures.

Both IFRS 17 and Solvency II require entities to estimate the present value of all future cash flows. Similarly, but exclusively concerning life products and Worker's Compensations -where the techniques follow life specific principles - PCES requires provisions to be ascertain according to prospective actuarial methods, taking into consideration all future expected premiums. However, this type of calculations is not currently required for most non-life products, potentiating differences to ongoing practices. Notwithstanding, whenever the Premium Allocation Approach is eligible the differences to the current accounting regime are less distinct, as discussed further in the report.

IV. Discount Rates

When considering the estimates of future expected cash flows the time value of money plays an important role, particularly when the entity is exposed to longer-term liabilities. Accordingly, in order to obtain relevant discount rates, IFRS 17 allows for two different approaches, the Bottom-up (hereinafter BU) and Top-down approach (hereinafter TD).

In this context, the principles-based nature of the new standard contrasts with the prescriptive guidance on Solvency II where the risk-free term structure and respective adjustments are defined by EIOPA, as further discussed on chapter 4.

In comparison to PCES, IFRS 17 will impose new challenges as no restrictions were previously imposed, except that discount rates should be chosen in a prudent way, considering the nature and timing of the underlying cash flows as well the assets backing up liabilities.

V. Allowance for Risk (Risk Adjustment/Margin)

On top of the expected present value of future cash flows, IFRS 17 requires the recognition of a RA, representing the extra return required by the entity due to the uncertainty of the underlying cash flows, which is a component without equivalent concept in PCES.

Under Solvency II, the calculation of the insurers' liabilities includes an additional provision, the Risk Margin, representative of the additional amount required by a third party to accept the transfer of the liability portfolio. Despite the similarities between the two concepts, the fact is that leveraging Risk Margins' techniques when applying IFRS 17 is not straightforward, as further discussed in chapter 4.

VI. Summary of the main findings

The following table presents a summary of the main differences and similarities between the three regimes on the key features of insurance liabilities just described.

	IFRS 17	PCES	Solvency II
	Similarity Level	●	●
Aggregation of Contracts	Three aggregation levels according to the type of contracts, timing of issue (12-months *cohorts*) and profitability.	No specific aggregation method. Current practices aggregate contracts by type of product.	Definition of Lines of Business (LoB) - classes of life and non-life insurance products - and Homogeneous Risk Groups (HRG) - groups of contracts with similar risks.
	Similarity Level	●●	●●
Recognition of Contracts	Earliest date between the beginning of the coverage period and the date when the first payment from the policyholder becomes due. For a group of onerous contracts, corresponds to the date when these become onerous.	The payment date, which corresponds or anticipates the beginning of the coverage period, as constrained by the national law for insurance contracts.	Moment when the undertaking becomes a party in the contract, giving rise to obligations, or the date the insurance or reinsurance cover begins, whichever date occurs earlier.
	Similarity Level	●●	●●●
Derecognition of Contracts	Date the insurance obligations towards the policyholder extinguish, or the contractual terms are considerably modified, reflecting the real risk exposure.	Limit of insurance contracts linked with the coverage that insurers are obliged to provide, and which arises from the payment of the premium by the policyholder.	Date the insurer has the unilateral right to terminate the contracts, reject or adjust premiums.
	Similarity Level	●	●●●
Cash Flows	Using market-consistent estimates, the fulfillment cash flows include the expected value of future cash flows, taking into account the time value of money.	Exclusively for life products and worker's compensations, provisions must be ascertain according to prospective actuarial methods, taking into consideration all future expected premiums.	Using market-consistent estimates, the best estimate (BE) is obtained considering all future cash flows, and taking into account the time value of money.
	Similarity Level	●	●●
Discount Rates	Two possible building approaches: The Bottom-up approach and Top-down approach.	A specific methodology is not prescribed.	Risk-free interest rate term structure prescribed by EIOPA, with inclusion, under certain criteria, of a Volatility or Matching adjustment.
	Similarity Level	-	●●
Allowance for Risk (Risk adjustment or margin)	RA (amount required by the entity for the uncertainty arising from the cash flows) gross of reinsurance. Disclosure of the confidence level.	The concept of a risk adjustment/margin is not present.	Risk Margin (amount required from a third party to accept the transfer of the liability portfolio), net of reinsurance. Use of the cost-of-capital methodology, with a 6% CoC rate.
	●●● High	●● Medium	● Low

2.3.2. Comparison on Profit and Loss Recognition

Under this section a detailed comparison on profit and loss recognition is developed between PCES and IFRS 17, with a further insight on the accounting requirements for contracts with direct participating features. Solvency II is excluded from this analysis since, being a prudential rather than an accounting regime, the main topics being discussed are out of its scope.

I. Profit Recognition

On the grounds that profits should not be recognized in advance, PCES includes two components, *Provisão Matemática* and *Provisões de prémios não adquiridos*, for the accounting of life and non-life products, respectively. Through their inclusion, as the premiums are received and recognized as revenue, the technical provisions, which constitute an expense, increase by the same amount, resulting in a null impact in the insurance result at inception.

On the same accounting perspective, IFRS 17 prevents the recognition of day one profits, however in order to achieve such objective it requires the constitution of the CSM. This amount is constituted to ensure a null effect on the insurance revenue between the expected cash inflows, which are recognized as an asset, against the expected cash outflows and the RA, which represent a liability.

At the end of each reporting period, both regimes require the application of accrual accounting principle. Whereas PCES achieves this by the release to the P&L, proportionally to the passage of time, of the liabilities initially recognized in the abovementioned accounts, IFRS 17 may increase the complexity of profit recognition by requiring the release of the CSM as services are provided. This is accomplished by the introduction of the coverage unit's concept, as further explained in chapter 5.

Finally, IFRS 17 also provides an alternative model, the Premium Allocation Approach (PAA), that, once eligible, is especially consistent with the concept of *Provisões de prémios não adquiridos*. In fact, under the latter, entities are also required to define their liabilities as the amount of premiums received.

II. Loss Recognition

In the presence of onerous contracts, meaning that a net outflow is expected to emerge from the group of insurance contracts, IFRS 17 requires for their separate accounting and to immediately recognize under the P&L the respective loss amount.

Under PCES, rather than accounting individually contracts which represent a liability, insurers must constitute a *Provisão para riscos em curso* for non-life insurance products. Under the latter, entities must constitute a provision corresponding to the amount necessary to address possible expenses that exceed the premiums charged. This provision must include the estimates of future claims and administrative costs, based on insurer's historical information. Consequently, the adoption of IFRS 17 will introduce important changes, including the estimation of cash flows based on current estimates.

IFRS 17, while requiring a forward-looking estimation of cash flows, will introduce a more dynamic mechanism for loss recognition and overcome some deficiencies of *Provisão para riscos em curso*. In fact, according to PCES, years in which onerous contracts expire a *Provisão para riscos em curso* is still in need to be constituted. This occurs because this provision is calculated based on the previous year's results, where losses were incurred. With the adoption of IFRS 17, loss-making contracts which cease to exist will no longer affect the insurers result in that year, providing more accurate information on the reported amounts.

III. Contracts with Participating Features

A contract with direct participating features, due to the investment-related components, does not include a transfer of significant insurance risk[5]. Thus, IFRS 17 contemplates an alternative approach to the General Measurement Model for this type of contracts - the Variable Fee Approach (VFA).

Under PCES, the similar accounting principles and measurement requirements as in IFRS 17 have been in practice for these contracts. Both frameworks understand the need of providing useful information

[5] IFRS 17 Insurance Contracts, paragraph 71.

to the users of financial statements, clearly identifying the return amount that corresponds to the insurance company and the one that is shared with the policyholder.

Nevertheless, while in PCES changes in the financial variables that correspond to the insurer are recognized immediately as profit or loss, under IFRS 17 these changes adjust the CSM, affecting, therefore, future rather than current profits.

IV. Summary of the main findings

The following table compares the treatment of profits, losses and contracts with participation features under both IFRS 17 and PCES.

	IFRS 17	PCES
	Similarity Level	●●
Profit Recognition	Through the inclusion of the CSM, no day-one profits are allowed. Insurer's profit at each reporting date is represented by the release of CSM as services are provided. If contracts are eligible to be measured according to the PAA, the insurance revenue for the period is the amount of expected premiums receipts allocated to the period on the basis of the passage of time.	No day-one profits are allowed due to the inclusion of the accounts *Provisões de prémios não adquiridos* and *Provisão Matemática*, for non-life and life insurance products, respectively. Premiums are released from these accounts and recognized as profit proportionally to the passage of time.
	Similarity Level	●
Loss Recognition	The loss amount arising from a group of onerous contracts, estimated based on future expectations, must be immediately recognized. A loss component must be acknowledged as an opposite accounting movement, in order to keep track of the liability.	For non-life insurance products, *Provisão para riscos em curso* represents the provision necessary to address possible compensations and expenses that exceed the premiums charged. This provision is estimated based on the insurer's historical information on claims and administrative costs.
	Similarity Level	●
Contracts with direct participating features	Measured under an alternative approach (Variable Fee Approach) the insurer's share of the change in the financial variables adjust the CSM, thus representing future profit. The policyholder's share is immediately accounted for.	Changes in the investment returns that correspond to the insurer or the policyholder are accounted separately. The proportion of the return that corresponds to the insurer is recognized in the P&L.

●●● High ●● Medium ● Low

3. Time value of money, financial and non-financial risks

As acknowledged in the previous chapter, to obtain the value of technical provisions, within the IFRS 17 context, entities must calculate all expected future cash flows adjusted by the time value of money, financial and non-financial risks. These adjustments are materialized by the inclusion of relevant discount rates and the RA.

IFRS 17 does not specify concrete methods to obtain the previously cited adjustments, only broad, principles-based guidance. Because the corresponding estimates have a significant impact on the measurement of liabilities, and consequently may have an influence on the insurer's financial position, they are further discussed under this chapter.

3.1. Discount Rates

3.1.1. Requirements for the determination of discount rates under IFRS 17

IFRS 17 requires discount rates to be consistent with observable current market prices (if any) for financial instruments with cash flows whose characteristics are consistent with those of insurance contracts, in terms of, for instance, timing, currency and liquidity[6]. Additionally, they shall be in agreement with other estimates used to measure insurance contracts, considering, among others, the variability of cash flows, or the effect of inflation, if these are nominal.

By requiring the above mentioned adjustments, the new standard aims to diminish mismatches between the insurer's liabilities and the instruments underlying discount rates. Therefore prevents discounting liabilities simply through the return on assets backing them - a common practice in many jurisdictions - which accommodates the assets' characteristics into discount rates, as opposed to the ones of the liabilities.

Moreover, the new standard requires the usage of current rates due to the updated information they provide, which, depending on ongoing practices, will affect insurers differently. Naturally, for those that discount cash flows using current market inputs, changes are expected to be less significant. However, in some jurisdictions, long-term insurance contracts are discounted based on historical rates, determined at inception, without being updated for changes in market conditions[7]. IFRS 17 attempts to uniform these practices, as showed in the figure 1.

Figure 1 - Discount rates used in 2015 for a sample of 72 listed insurance companies using IFRS Standards

Type of rates		Current Rates	Historical rates	Mix of Rates	Total
Nº of Companies	IFRS 4	31	25	16	72
	IFRS 17	72			72

[6] IFRS 17 Insurance Contracts, paragraph 36(b).

[7] IFRS 17 Insurance Contracts, Project Summary, May 2017

Source: IFRS 17 *Insurance Contracts*, Project Summary, May

Despite the aforementioned requirements, it is acknowledged that discount rates which reflect all characteristics of insurance contracts may not be directly observable in the market. Thus, these may be estimated, according to two available approaches. Notwithstanding, within their calculations, entities must maximize the usage of observable inputs, reflecting all current market conditions. The approaches are briefly summarized in the following paragraphs, and further insights are searched for in the two next sections of this chapter.

The BU has as the starting point the risk-free yield curve, meaning a yield curve, in the appropriate currency, for instruments that expose the holder to no, or negligible, credit risk[8]. This must be adjusted for differences in liquidity between the financial instruments included under the yield curve and the insurance contracts that discount rates will be used for. The consideration of an "illiquidity premium" rests in the fact that the assets that constitute these risk-free yield curves can be sold in liquid and diversified markets, which is typically not the case of insurance contracts.

Under the alternative approach, the TD, the insurer's liabilities must be discounted based on the yield curve of return implicit in the fair value measurement of a reference portfolio of assets[9], according to IFRS 13. The quoted yield curve should then be adjusted to exclude any features of the assets that are not relevant to the insurance contracts.

The two above alternatives should lead, theoretically, to the some discount rate, but it is acknowledged that the BU and the TD may result in different yield curves, even in the same currency[10]. Moreover, entities only need to perform their estimations according to one of the methods, without being required to disclose the alternative one, nor to reconcile the differences between the two.

3.1.2. Techniques for the Estimation of Discount Rates

As explained in the previous section, IFRS 17 solely provides the overall qualitative principles for the estimation of discount rates, leaving open room for their materialization. This section aims to assess possible solutions for these challenges, and evaluate the impact that different interpretations of the requirements may have on insurer's results.

The development of the present analysis was constraint by the lack of relevant bibliography on the possible methods to obtain the discount rates. Most of the available material provides theoretical solutions, however when examples are developed, the common procedure is to assume flat discount rates. Because such simplification may imply disregarding an important source of heterogeneity, the objective of this report is to go further and provide insights on the construction of yield curves.

This endeavor is developed initially for the BU, where alternative methods, within the guidance of IFRS 17, are discussed. Firstly, to assess the construction of the yield curves at a national level, the inputs are consistent with the ones of Portugal. Whenever these inputs rely on data from European markets, and so may be applicable for the majority of the European Insurers, the results and respective conclusions are generalized. Subsequently, inconsistencies across different jurisdictions are assessed by using the same estimation techniques but considering countries in different continents. The aim is to reflect that IFRS 17 is a global standard, to be applied under countries facing different economic realities and historical backgrounds. For this purpose, the United States of America (US), Japan (JP) and Australia

[8] IFRS 17: Insurance Contracts, paragraph B79.
[9] IFRS 17: Insurance Contracts, paragraph B81.
[10] IFRS 17: Insurance Contracts, paragraph B84.

(AU) are considered, and the inputs used are consistent with the ones of each jurisdiction. Finally the same structure of analysis is developed considering the principles under the TD.

In order to perform the present assessment, the same set of cash flows is used for all scenarios, such that the differences discussed solely reflect variations on their present value using different yield curves, and not on the amount, or profile, of the cash flows. Moreover these are not specifically intended to represent the typical behavior of a specific line of business, but rather to cover a multitude of cash flow profiles, which are simulated under 1 000 scenarios, each for a period of 30 years (the time length is due to the availability of the data used for the estimates of discount rates).

I. Bottom-up Approach

Defining the risk- free term structure

Considering the guidance provided on IFRS 17 for the BU, the starting point for the estimation of discount rates is the identification of an appropriate risk-free term structure. Instruments that may be used for this purpose are high rated government bonds, due to the low risk perceived.

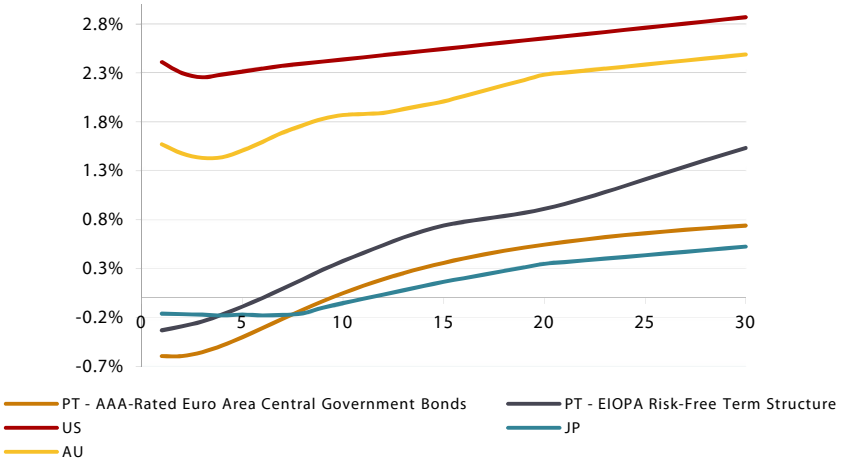
The main advantage resulting from the usage of government bonds is the possibility of using observable data, which is commonly available for long maturities, and consequently should reduce the necessity of extrapolation techniques. Other alternatives can be conceived as solutions, such as interest rate swaps or low risk corporate bonds.

Under this analysis, the risk-free term structures considered for the US, JP and AU are built using the respective government bonds. However, PT government bonds are evaluated as not sufficiently high rated instruments to be considered as risk-free. Thus, under the national reality, other yield curves are considered, including the return on high rated government bonds in the EU, or the EIOPA risk-free term structure. The two quoted curves are relevant for any country within the EU, and so the present analysis can be generalized.

Differences can already be noticed when determining the basis for the discount rates, since, as shown in figure 2, logical choices for the risk-free term structure for each jurisdiction are considerably different. It is observable that the risk-free rates relevant for PT/EU only become positive in tenth year, while in its first year of maturity the one for the US exhibits a rate of 2.4%. Differences can arise even within the same jurisdiction, since the two yield curves mentioned in the previous paragraph, both appropriate for the PT/EU reality, have an average difference of 38 basis points.

The data is used for the construction of the following yield curves can be found in more detail in Appendix A.2.

Figure 2 - Relevant Risk-free Term Structure for each Jurisdiction



Defining the Illiquidity adjustment

Once the risk-free term structure is identified, it becomes necessary to estimate the IA, which represents the difference in liquidity between the insurance liabilities and the assets underlying the initial reference yield curve. However, these illiquidity considerations should not be understood as the concept of liquidity risk, which represents the imbalance between the liquidity sources and needs. The inclusion of this IA component intends to acknowledge that the assets composing the risk-free yield curves are traded in deep and liquid markets, thus an investor is expected to be able to rapidly sell them without incurring significant costs. This is not the case for the policyholder in most insurance contracts because, as explain in the standard, the entity cannot be forced to make payments earlier than the occurrence of insured events, or the dates specified in the contract[11].

For IFRS 17 purposes, the illiquidity is linked to behavior of the policyholder, and its impact on the liquidity profile of the contracts. Thus, these are more liquid as they may be easily discontinued without incurring significant costs. In order to clarify this idea, sources of illiquidity arising from insurance contracts are illustrated in the next paragraphs.

A source of illiquidity on the insurance contracts emerges from their features and the respective effects on the policyholder's actions. These features may include the existence of a surrender penalty or the duration of the contract. In this context, a motor insurance contract can be regarded as having more illiquid features than, for instance, an endowment insurance, as if the latter is surrendered before the contract's maturity it generates a significant liquidity need, irrespectively of death/survival.

Alternatively, contracts may possess illiquid features as a result of the policyholder being unable, or not willing, to surrender the contract without substantial loss in value, which is the case, for instance, of contracts that guarantee higher returns than similar ones currently available in the open market. As an opposite conceptual example, if in a term life assurance the premiums being paid by the policyholder are higher than the ones currently charged in the market, there might be a gain in value by exiting the contract and acquiring a new one.

Finally, the illiquidity of insurance contracts is also linked to their time to maturity. Because these typically require the payment of a surrender penalty, the shorter the remaining maturity the lower is the incentive to lapse the contract.

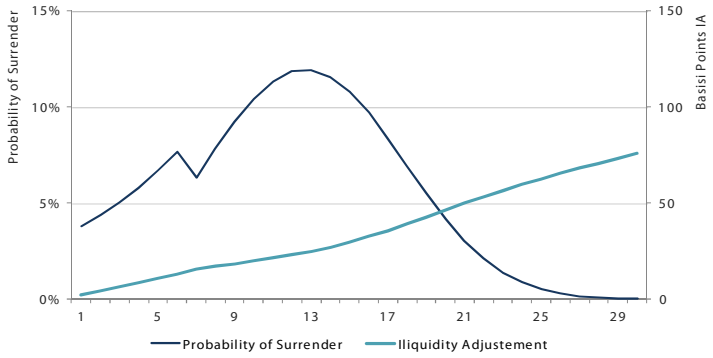
Having analyzed the qualitative nature of the illiquidity adjustment, still a mechanism to quantitatively measure this component needs to be determined. In the present analysis the probability of surrender

[11] IFRS 17 Insurance Contracts, paragraph B79.

is considered for the basis of the IA. This was simulated for each contract and maturity, through a stylized behavior, that still allowed some range of variability. The detailed reasoning for its construction is explained in the next paragraph and one of the resulting simulations can be seen in figure 3.

In earlier years the simulated probability of surrender is assumed to grow more slowly, since it is not expected that significantly more attractive products are available in the market. However, for consumers more attentive to the market conditions, as these become more favorable, there is a realization of a gain in value, which is represented by a first peak of surrenders assumed to occur in year 6. After this initial effect is assuaged, the probability of surrender decreases in the following year, until the generality of policyholders starts being aware of the availability of more attractive products (assumed to be expectable seven years after the beginning of the original contract), lapsing more frequently through a more widespread time period. This behavior continues until the moment when, given the shorter remaining period until the end of the contract and the amount of the surrender benefit, the probability of surrender starts to decrease, ultimately reaching zero.

Figure 3 - Simulated Probability of Surrender and Corresponding IA



The IA, also represented in figure 3, is extracted from the simulated probability of surrender, enhancing the fact that as the surrenders increase the lower should be this adjustment. Furthermore, as the time to maturity increases, because the contracts become more illiquid, the adjustment increases. However, it is not adjusted for specific features of the contract, since the cash flows used were randomly simulated without representing a specific type of insurance product or its contractual structure. For each date the illiquidity adjustment is empirically obtained with the following equation:

$$IA_t = bp \cdot (1 - P_t^S) \cdot \left(\frac{t}{T}\right), \quad (1)$$

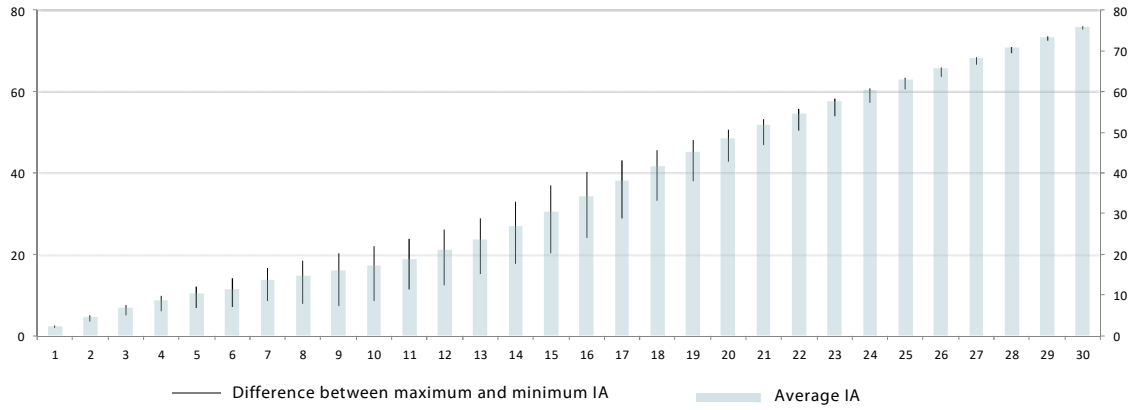
Where, bp represents the basis points that the entity considers appropriate to be added to the risk-free rate at the end of the contract, when the probability of default is zero, P_t^S the probability of surrender at time t, and T the maturity of the contract, in years.

Although in the present report no extensive alternatives are considered for the determination of the bp, this could be seen as the difference between the risk-free rate, at the respective maturity, and a "long-term interest rate". Under the present assessment it assumed that the latter is 1.5% and, given the PT risk-free rate of 0.74% at a 30-years maturity, this translates in the variable bp being equal to 76 basis points. For the alternative jurisdictions the same absolute increase at maturity (bp) is assumed, which, proportionally to the risk-free rate, translates in a higher increase in the JP and lower in the US and AU.

In order to understand the impact of the different simulations of the probability of surrender on the discount rates, in figure 4, the average IA is compared with the minimum and maximum accrual to the risk free rate, at each maturity.

It is shown that, even considering the probability of surrender as the only driver of illiquidity, the differences are already noticeable. These are more prominent in middle durations, as the methodology used assures that in the first years the IA is close to zero and reaches the 76 basis points in the end of the 30 years. Moreover, the most significant difference between the maximum and minimum IA can be seen in the 15th year, corresponding to 16 basis points. This translates into the average simulated liability discounted with the highest IA, corresponding to approximately 97% of the one using the minimum, at this maturity (considering that the IA is added to the risk-free term structure relevant for PT/EU).

Figure 4 - Comparison between average, minimum and maximum IA for each maturity



Defining the yield curve

Having determined the illiquidity adjustment for each group of contracts and all maturities, these are added to the risk-free rate, obtaining the discount rate for each maturity as follows:

$$Discount\ Rate_t = R_t + IA_t \quad (2)$$

Where, R_t represent the risk-free rate at time t.

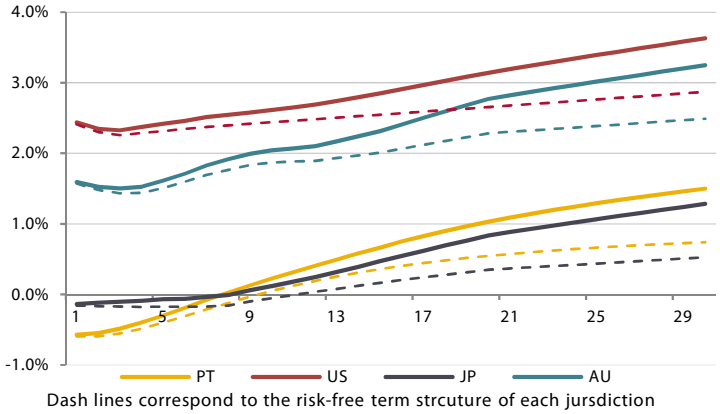
The resulting yield curves can be seen, for each country, in figure 5. Whereas for Portugal the risk-free term structure is considered to be the return on the AAA-rated Euro Area Central Government Bonds, for the remaining jurisdictions this is considered to be the yield on the respective domestic government bonds.

Because the technique used to measure the IA, and the variable $\boldsymbol{bp}$, is the same for all jurisdictions, the disparities between the yield curves are a direct reflection of the differences in the risk-free term structures. However, and focusing again in the results obtained PT/EU, the consideration of the IA allows for liabilities to be discounted with positive yields from the seventh year forward. This translated in anticipating the positive discount rates in two years, when compared with the risk-free term structure. Also in the seventh year, the yield for the US is 2.5%, and at maturity the estimated discount rate equals to 3.63%, being at this date the difference to the PT/EU rate of 2 percentage points.

Even if in the present report no alternative solutions are explored for $\boldsymbol{bp}$, it is conceivable that differences would arise given different judgments of this variable. For example, entities within a jurisdiction with the underlying risk-free assets providing higher returns, such as the US, may be more inclined to consider a lower upward adjustment than PT insurers, which discount liabilities with rates closer to zero. Thus, the source of the differences across jurisdictions would not only be the risk-free

term structures, but also the upward adjustments. Moreover, dissimilarities between the yield curves would also be noticeable if other techniques to obtain the IA are considered.

Figure 5 - Yield Curves relevant for each jurisdiction obtained with average IA

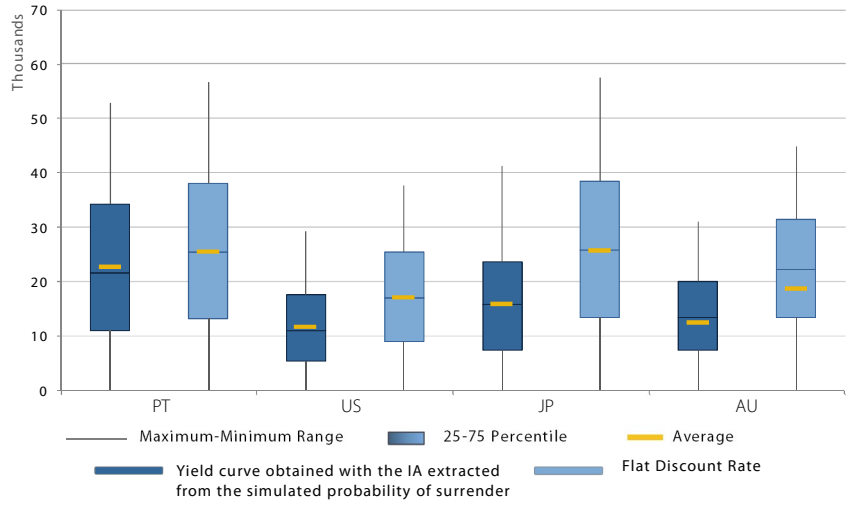


Dash lines correspond to the risk-free term strcuture of each jursdiction

Given the yield curves relevant for each jurisdiction, the distribution of the present value of the cash flows is calculated, and the results presented in figure 6. It is important to notice that the first simulation of the probability of surrender is assumed to correspond to the first simulation of the cash flows, despite not being intrinsically related.

Across the different jurisdictions the distributions of the present value of future cash flows differ substantially, again due to the differences in the risk-free term structure relevant for each country. These disparities ultimately challenge the level-playing field that IFRS 17 aims to create. In fact, due to the previously obtained curves, the average US discounted liability corresponds to only 74% of the PT/EU one. Given the equal underlying cash flows, and the need to disclose the discounted amounts under the financial statements, these differences may ultimately affect the competitiveness of entities, which is worrying in case of an environment of high cross border activities.

Figure 6 – Comparison of the distribution of present value of cash flows between using BU with the IA extracted from the simulated probability of surrender or using a flat discount rate



In order to overcome some of the complexity introduced by IFRS 17 on the construction of discount rates, it is conceivable that some entities might simplify such requirements, for instance, by adding some basis points to the risk-free term structure or, more extremely, using a constant discount rate for all maturities. In order to understand the impact of these simplifications, in figure 6 the previous results

are compared with the present value of cash flows using flat discount rates. These rates are the result of the sum of the average of the risk-free interest rates of each jurisdiction and the average IA between all simulations and maturities.

The increase on the present value of future cash flows varies considerably across jurisdictions due to the same upward adjustment to different risk-free rate averages, revealing the different effects of this type of simplification. It is observable that for the national reality this increase is not as substantial as for other countries. In fact, the average increase in each of the remaining jurisdictions surpasses 30%, while in PT is 10%.

II. Top-down Approach

Defining the reference portfolio of investments

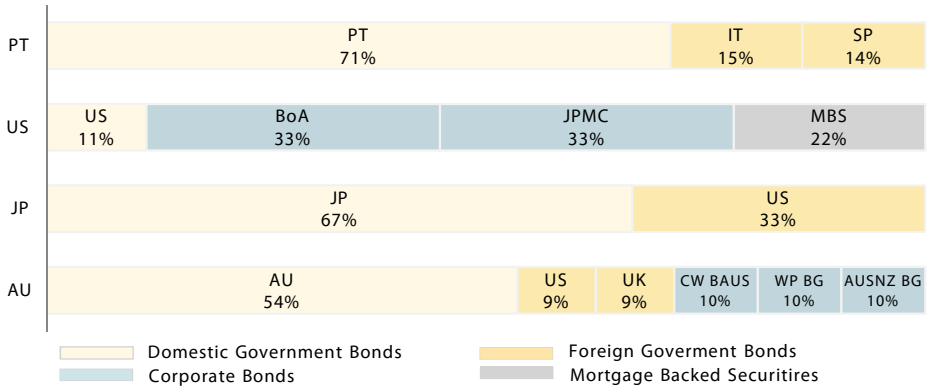
As an alternative to the BU, considered in the previous section, IFRS 17 allows the TD for the construction of yield curves. Under this approach a downward adjustment should be made to the return on the assets backing up the insurer's liabilities.

Considering IFRS 17 requirements under the TD, the first step is selecting the reference portfolio, for which the standard does not comprise any restrictions. However, the choice of a pool of assets with similar characteristics as the insurance contracts is advised, such that fewer adjustments are necessary. As an example, for contracts that do not vary based on the returns of the underlying assets, the choice of debt securities rather than equity instruments may be more appropriate since these, being fixed-income assets, better reflect the contracts' features.

Despite the differences that may emerge given the existence of multiple techniques to aggregate the returns of individual assets in a unique curve, IFRS 17 prescribes that the latter should replicate the overall yield, which is important to distinguish so that the assets' volatility is not replicated on to discount rates.

Under the current analysis the reference portfolios were obtained through a pragmatic approach, searching for a restricted number of assets that, combined, represent a meaningful share of the overall portfolio. These were built based on the securities representing more than 40% of the total investments of an average insurer in the each jurisdiction. The securities used, as well as the respective weights are presented, per country, in figure 7, and more detailed information on their composition can be found in Appendix A.1.

Figure 7 - Instruments and Corresponding Weights of Reference Portfolio for each Jurisdiction

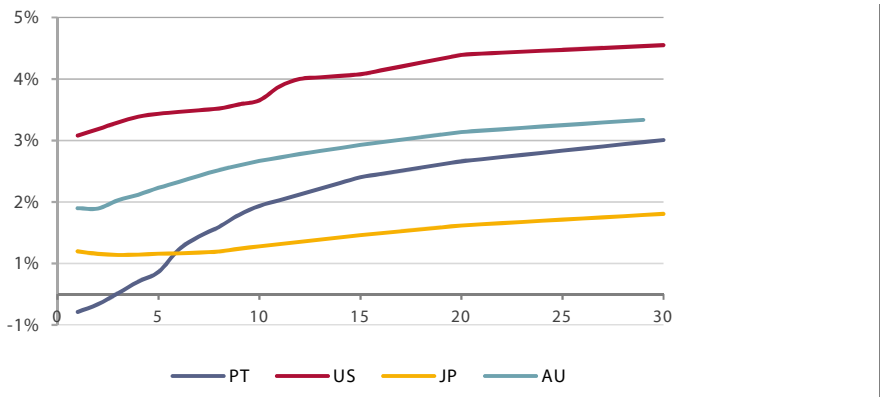


Given the weights of the instruments composing the reference portfolios, and the respective returns, the starting point for the estimates of discount rates, under the TD, are obtained. As showed in figure 8, just like in the BU, the yield curves differ considerably across jurisdictions, being the average

difference between the US and PT curves of 2 percentage points. It is observable that, due to the instruments that compose the national reference portfolio, this is the only jurisdiction which provides negative returns in earlier maturities, extending until the second year. This is particularly unfavorable since under the TD approach a downward adjustment is made to these yield curves.

The data is used for the construction of the following yield curves can be found in more detail in Appendix A.2.

Figure 8 - Yield Curves underlying the Reference Portfolio of each Jurisdiction



Defining the adjustments to the yield curve of the reference portfolio of investments

Given the return on the reference portfolio of investments, IFRS 17 prescribes that entities should adjust the yield curve for factors that are not relevant to insurance contracts. It is not required, though, to acknowledge differences in liquidity between the assets and the insurer's liabilities, as in the case of the BU.

The adjustments should include differences in amount, timing and uncertainty between the assets and the contracts, as well a market risk premium for credit risk, which is exclusive of assets. Consequently, the materialization of these adjustments will mostly depend on the type of instruments composing the reference portfolio. In fact, considering contracts that do not vary based on the return of assets, if equity instruments are selected, a higher adjustment is expected than considering debt securities, due to the higher uncertainty of the underlying cash flows.

Acknowledging the two adjustments set by the standard, the present assessment will solely rely on possible solutions for the measurement of the market risk premium for credit risk. These results from the fact that the insurance contracts are simulated without exemplifying any specific business and the asset portfolios are illustrative of the average investments in each jurisdiction. Thus, the evaluation of the level of similarity between the two in terms of timing, amount and uncertainty, as required by IFRS 17, is limited and would require the introduction of new assumptions on the underlying cash flows.

Thus, focusing on the market risk premium for credit risk, IFRS 17 conceives credit derivatives as a possible solution for the materialization of the upward adjustment whenever the asset portfolio is composed of debt securities. Subsequently, considering that under the current assessment the reference portfolios are only composed of fixed income securities, *Credit Default Swaps* (CDS) are used for the calculation of the market credit risk.

CDS are derivatives which allow the buyer to be protected in the case that the issuer of the underlying security defaults. This means that, if the issuer does not make the payments that are due, the seller of

the CDS covers these payments. Therefore, the price of CDS allow for an extrapolation of the issuer's probability of default[12]:

$$S = q \cdot (1 - R) \quad (3)$$

Where S is the CDS spread, q is the probability of default and R is the recovery rate.

Given the historical values of the CDS prices composing the different reference portfolios, and assuming a recovery rate of 40%, it is possible to obtain the implicit probability of default of the reference portfolio.

Having established a method to extract the probability of default from the CDS prices, in the present assessment the discount rates are empirically obtained according to the following equation:

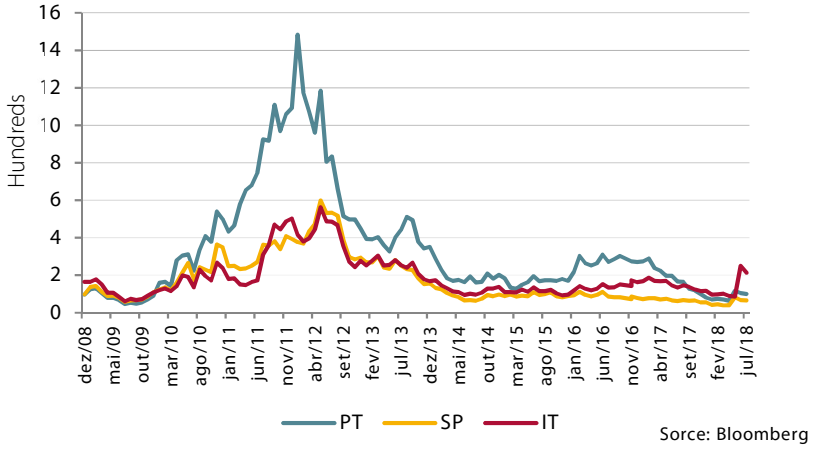
$$Discount\ Rate_t = y_t^{rp} \cdot (1 - t \cdot q) \quad (4)$$

Where y_t^{rp} is the return on the reference portfolio at time t, and q the probability of default.

In this methodology, q is extracted from the CDS prices observed in a specific moment in time. Thus, in order to reflect the increase in the uncertainty of the bond issuer throughout the period this variable is multiplied by the time to maturity, implying that the probability of default increases linearly with t.

CDS prices vary considerably during time, and specially increase in time of fragile economic conditions or distressed credit outlook, as shown in figure 9, through the historical prices of the 5 years CDS for Portuguese, Italian and Spanish government bonds. Therefore, when using CDS as a measure for the credit risk premium, insurers may be more or less prudent on their calculations, using, therefore, higher or lower historical values of this instrument.

Figure 9 - 5-Years CDS Prices of Portuguese, Spanish and Italian Government Bonds



Sorce: Bloomberg

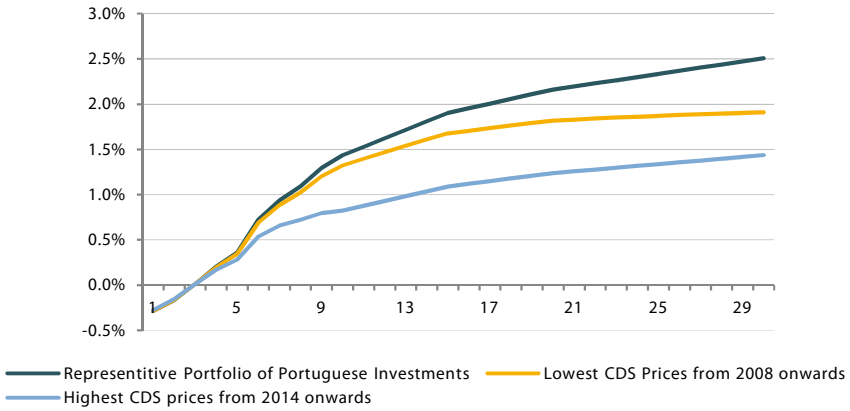
Consequently, to evaluate the impact of the usage of different prudence levels, two yield curves for each jurisdiction were calculated, using as the basis for the calculation of the credit risk adjustment the highest and the lowest value of the probability of default implicit on the reference portfolios.

However, because the highest probability of default implicit in the Portuguese reference portfolio is 20.36%, given the present technique, this would produce unreasonable yield curves, and so extra considerations must be done. The highest probability considered is 4.24% which corresponds to the maximum CDS price from 2014 onwards. Moreover, it is assumed that from the moment which the increase of this adjustment leads to a downward slope of the yield curve, which corresponds to 10th

[12] Deutsche Bank Research, Sovereign default probabilities online- Extracting implied default probabilities from CDS spreads

year, t is kept constant, equal to this maturity. This translates in assuming that the uncertainty relatively to the issuer does not change from this moment onwards. The resulting yield curves relevant for Portugal can be seen in figure 10.

Figure 10 - Yield Curves relevant for Portugal obtained for TD



It can be seen that in lower maturities the yield curves coincide. This is justified by the fact that no adjustment is being considered, as the returns on the reference portfolio are negative during this period. Afterwards the differences start to emerge, showing the importance of different prudence levels in the construction of the yield curves. In fact at a 30-years maturity, the more prudent entity will discount its liabilities with a return 25% lower than the one which uses the lower CDS historical price.

With the previously obtained yield curves, the distribution of the present value of the cash flows is calculated, and the results are shown in figure 11. The differences across jurisdictions are mainly justified by the contrasting returns on the representative portfolio of assets. Conversely, the risk intrinsic to these portfolios justifies the magnitude of the differences when using different prudence levels.

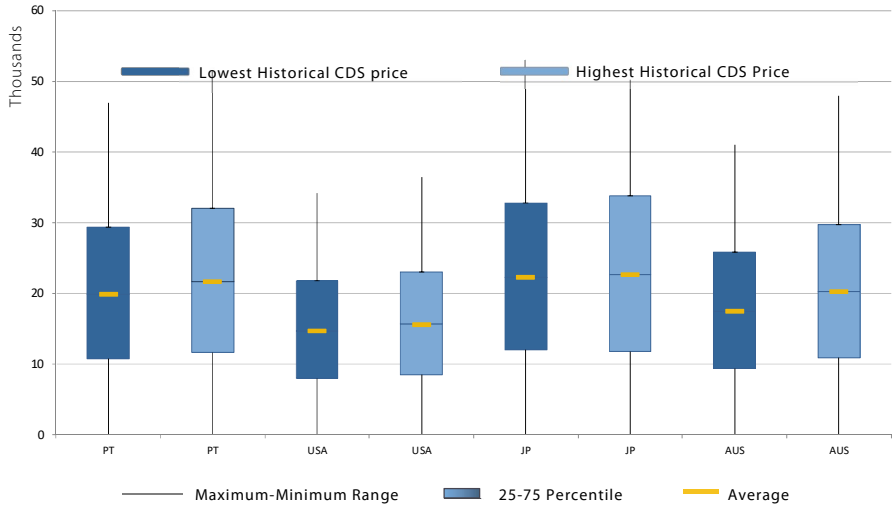
In this context, the impact of using different prudence levels was especially not notable in JP, with an average increase of the present value of cash flows using the lowest historical CDS price to the highest close to zero. This is explained by the permanently low risk associated with both US and JP government bonds.

The US distribution shows a higher average increase than the one of JP (6%) but still significantly lower than the one of AU (16%). Both increases surpass the one of JP due to the inclusion, within the reference portfolio of investments, of corporate bonds. These instruments imply a higher volatility of CDS prices than the one of low risk government bonds. Additionally, the differences between the US and AU are justified by the differences in the instruments' rating, which by being lower in the case of AU, is associated with a higher CDS historical price.

Finally, and despite the Portuguese reference portfolio being only composed of government bonds, the differences in the underlying distributions are explained by the fact that these have more volatile CDS historical prices, as previously noted. However, some caution must be taken when comparing the results obtained for Portugal and the remaining jurisdictions. In fact, the Portuguese reference portfolio showed the highest implicit probability of default. However, under the present assessment this value was censured, and as opposed to the other jurisdictions, remained constant from the 10th year onwards. Consequently, the average present value of cash flows showed an increase of 9% when comparing the results from using the lowest to the highest prudence level, which is much lower than the one of AU, despite the clearly higher probability of default. This assessment allows understanding that the introduction of the entities' own expert judgment on the construction of the yield curves implies that

the comparability of the financial statements must be complemented by a full comprehension of the reasoning behind the underlying estimation technique.

Figure 11 - Distribution of the Present Value of Cash Flows using the TD



3.1.3. Comparison between the Bottom-up and the Top-down approach

IFRS 17 explains that, theoretically, the BU and the TD approach should lead to the some discount curve. This is justified by the fact that for cash flows of insurance contracts that do not vary based on the returns of the assets in the reference portfolio, there should be a single illiquid risk-free yield curve that eliminates all uncertainty about the amount and timing of cash flows[13]. However, given the different adjustments required in each approach, the resulting yield curves are unlikely to coincide.

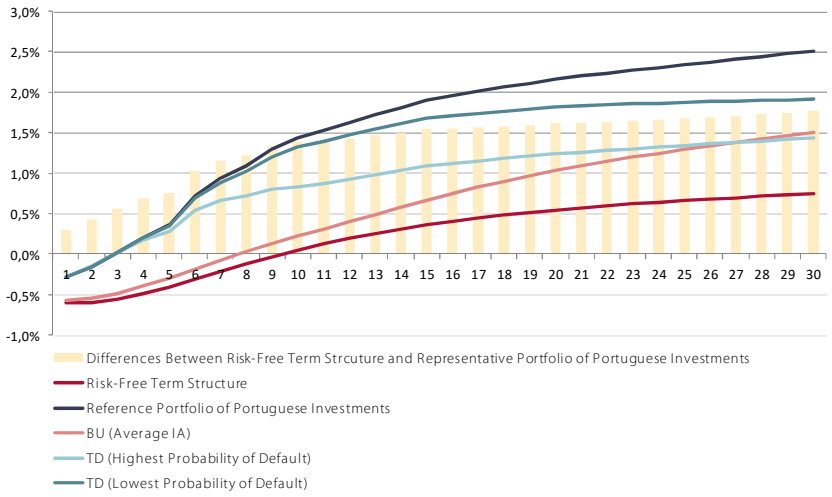
Figure 12 shows the different discount curves, obtained in the previous sections for the Portuguese reality, using both BU and TD. The yield curve presented for the BU is the average of the ones obtained for each simulation.

Given the estimations performed in each approach, these show the implausibility of a single relevant yield curve. The starting points of the BU and TD, respectively the AAA-rated euro area central government bonds and the representative portfolio of Portuguese investments have considerably different shapes. The differences between the two can also be seen in Figure 10, represented in bars, being the average 1.4 percentage points.

In the 27th year of maturity, the more prudent TD discount curve, and the one obtained under the BU with the average IA, cross. However, in the remaining maturities the results diverge considerably, showing the unlikelihood of finding a mechanism that would lead the two curves to overlap over the thirty years. Moreover, in the year which the two curves coincide, the illiquidity adjustment equals to 97% of the risk-free rate at the same date. On the other hand, the downward adjustment under the TD corresponds to 42% of the return on the reference portfolio. Even if the latter is not as significant as the former, because this decrease is disadvantageous, the incentive of an entity to do an adjustment of this magnitude may be questionable, comparing with an increase of the same, or greater, scale under the BU.

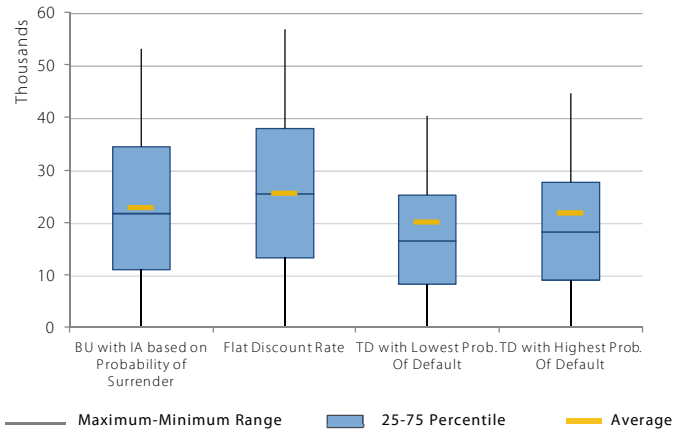
[13] IFRS 17 Insurance Contracts, paragraph B84.

Figure 12 - Comparison between the obtained Yield Curves using the BU and the TD relevant for Portugal



As a consequence of the differences obtained under the two approaches, the resulting distributions of the present values of cash flows can be seen in figure 13. It is shown that for insurers with the same exact cash flows, but using different discount curves, the distribution of their present value is considerably different. In fact, with the yield curve resulting from the TD with the lowest prudence level, the average discounted cash flow equals to 78% of the one using a flat discount rate.

Figure 13 - Comparison between the Distribution of the Present Value of Cash Flows using yield curves obtained in the BU and TD



3.1.4. Comparison between Discount Rates under IFRS 17 and Solvency II

As already mentioned in chapter 2, IFRS 17 will be in force alongside with Solvency II. Despite their dissimilar purpose, both require the calculation of the present value of future cash flows using relevant discount rates. Thus, the principles for the construction of these rates under the two regimes are compared in the following paragraphs.

Solvency II is prescriptive on the discount rates to be used by insurers, which contrasts with the principles-based nature of IFRS 17. In fact, under the prudential regime the risk-free term structure is prescribed by EIOPA, for each currency on a monthly basis. This term structure is derived from interest rate swaps, adjusted for credit risk. For each currency the Last Liquid Point (LLP) is determined based on the last maturity for which there is a deep, transparent and liquid (DTL) market for interest rate swaps. Beyond the LLP interest rates are extrapolated, converging to the Ultimate Forward Rate (UFR).

This UFR is a function of long-term expectations of the inflation rate, and of the long-term average of the short-term real rate[14]

Just as Solvency II requires the usage of a relevant risk-free term structure, under the BU, this is the starting point for the estimation of the discount rates. Consequently, for European insurers it can be operationally appealing to use the yield curve already being used for prudential purposes. Nonetheless some of the prescriptive elements of Solvency II may be adjusted in order to accommodate the entities' own perspective on these, such as the LLP, which for the euro is considered to be 20 years and the UFR which is currently at 3.9%. Furthermore, while the risk-free yield curve, under Solvency II, is constructed based on interest rate swaps, IFRS 17 allows for more flexibility, not allocating any restrictions on the instruments for its composition.

Given the risk-free term structure just described, Solvency II allows for these to be adjusted upwards, by considering the Volatility Adjustment (VA). Even if this adjustment might somehow resemble the BU, it is unlikely to provide any leverage to insurers when applying IFRS 17. In fact, while the upward adjustment in the prudential framework aims to reflect the short term volatility in financial markets, in the accounting standard this must reflect the features of liabilities.

Besides the VA, Solvency II allows the risk-free term structure to be adjusted through the Matching Adjustment (MA), reflecting the stable characteristics of liabilities of entities which participate as long-term investors. The MA is derived from the spreads between the interest rate that could be earned from the undertaking's assets and the basic risk-free interest rates. This is reduced by a fundamental spread, prescribed by EIOPA, which reflects the expected loss from default and downgrade of the undertaking's assets[15]. Although the guidance for the MA generally resembles the TD under IFRS 17, some considerations still need to be made, including the fundamental spread which may be calibrated to reflect the entities' own management choices.

Nevertheless, the usage of the MA is subjected to supervisory approval, and due to the amount of requirements needed to be met in order to apply it, only two countries in Europe have entities which are eligible for its usage -15 undertakings in Spain, and 23 in the United Kingdom[16]- Furthermore, this adjustment is typically eligible only for specific segments of the insurer's liabilities and the corresponding assets. Consequently, even if there is some level of similarity between the MA and the TD approach, it does not seem likely that the generality of insurers will draw any synergies from these.

3.2. Risk adjustment

Given the nature of insurance contracts, IFRS 17 highlights the importance of the entities' reporting figures to provide clear insights on the sources of insurance profits, distinguishing the ones that emerge from providing services and the ones from bearing the underlying risks. Thus, on top of the expected present value of future cash flows, a RA must be included within technical provisions to reflect the non-financial risks assumed by insurers. Just like other components for the measurement of insurance contracts, this adjustment is set on a principles-based framework. In the present section this concept is explained and possible methods for its calculation are discussed.

[14] EIOPA (2014) Technical Specification for the Preparatory Phase (Part II)
[15] EIOPA (2017) Report on long-term guarantees measures and measures on equity risk
[16] EIOPA (2017) Report on long-term guarantees measures and measures on equity risk

In Appendix A of IFRS 17, the RA is defined as the compensation an entity requires for bearing the uncertainty about the amount and timing of cash flows that arise from non-financial risks, as the entity fulfils insurance contracts.

The inclusion of this component, while aiming to deliver information of relevance to the users of the financial statements on the risks assumed by insurers, should reflect the entities own assessment of those risks. In this sense, it must reflect the insurer´s own risk aversion, including the diversification benefits that it considers being appropriate, and both favorable and unfavorable outcomes should be taken into account. Additionally, the level of aggregation required for its calculation is not prescribed by IFRS 17, since, by doing so, it would contradict its entity specific nature.

In estimating the RA only the non-financial risks that emerge directly from insurance contracts should be considered, while the financial risks have been accessed under the discount rates. This separation stands on the fact that some risks of insurance contracts besides not being proportional either to the amount or the time until maturity may, as well, have more influence in the cash outflows than inflows. Consequently the aggregation of these two elements, financial and non-financial, in one unique yield curve would not produce information of relevance regarding the risks which an entity is exposed to.

Having explained the overall meaning of the RA and the purpose of its inclusion under the insurer's liabilities, possible methods for its calculation are discussed on the next section. Moreover, given its perceived similarity with the Risk Margin of Solvency II, the two adjustments are compared and the possibility of leveraging on the prudential regime's techniques is discussed.

3.2.1. Estimation techniques for the Risk Adjustment under IFRS 17

In paragraph B92 of IFRS 17 some general principles that should be taken into account when estimating the RA are given:

(a) Risks with low frequency and high severity will result in higher RA than risks with high frequency and low severity;
(b) For similar risks, contracts with a longer duration will result in higher RA than contracts with a shorter duration;
(c) Risks with a wider probability distribution will result in higher RA than risks with a narrower distribution;
(d) The less that is known about the current estimate and its trend, the higher will be the RA;
(e) To the extent that emerging experience reduces uncertainty about the amount and timing of cash flows, RA will decrease and vice versa.

Additionally, IFRS 17 acknowledges the need of providing a comparison source for the readers of financial statements. Thus, it requires the disclosure of the confidence level to which the RA corresponds (left to be selected by entities) even when an alternative technique is chosen.

In the next subsections two possible techniques for the calculation of the RA are discussed, the Value at Risk and the Cost-of-Capital methodologies. Moreover, some alternative methods such as Tail Value at Risk and a simplified method, using a proportionality factor, are briefly introduced.

I. Value at Risk

The insights given during the master's degree on risk measures, especially in the Risk Theory course, were fundamental for the development of the present section and some of the material provided under this class was extensively used.

The Value at Risk (VaR) approach defines the amount of capital required to ensure, with a high degree of certainty that the enterprise does not become technically insolvent[17]. This approach may seem appealing to insurers since it is already required the disclosure of the confidence level to which the RA corresponds. Consequently, the usage of the same technique for measurement and disclosure purposes not only adds consistency, but it also reduces the necessity of additional calculations. Furthermore this is a relatively common technique, easily interpreted by the users of financial statements.

In order to obtain the RA using the VaR technique, entities may perform stress tests, use stochastic modelling or, in a more simplistic approach, assume a loss distribution function. This may impose some challenges considering that the utility of using the VaR decreases for distributions not normally distributed, as it is commonly the case of insurance losses. In fact, considering fat tailed distributions, the usage of the VaR may not fully capture low frequency and high severity events, which is in fact, one of the characteristics for a higher RA under IFRS 17.

The VaR technique is currently used in Solvency II for the estimation of the SCR - calculated at the 99.5th percentile on the amount of own funds over a one year period- and for which both stress tests and correlations are calibrated by EIOPA. Notwithstanding the utility of using already in force systems, the usage of the prudential regime's techniques for the estimation of the RA should be followed by an assessment of the relevance of such inputs.

Due to the fact that the RA should only integrate the non-financial risks that entities are exposed to, the stress tests appropriate for Solvency II may be readdressed to only capture those risks. Moreover, the existing correlation matrices, provided by EIOPA, may be adjusted through expert judgment. This is especially important if a confidence level other than 99.5 is chosen, as the correlations between normal and extreme events used in Solvency II may not be appropriate under the new confidence level. Furthermore, in order to ensure that the aggregation of the submodules, which are calibrated at a 99.5% confidence level, would also result in the same confidence level, it is assumed that loss distributions belong to the elliptical family of distributions. Consequently, if entities use these inputs, they must be comfortable in assuming that their loss distribution belongs to this family of distributions.

An alternative risk measure that may be used to obtain the RA is the Tail Value at Risk (TVaR), which overcomes some limitations of the VaR. The TVaR defines the expected value of losses, given the occurrence of an extreme event, consequently being more insightful to the tail of distributions. This technique may be appealing for insurers which already use it for prudential regimes, which is the case of insurers in Switzerland using the Swiss Solvency Test (SST), which uses the 99% TVaR.

II. Cost-of-Capital Methodology

As an alternative technique for the calculation of the RA, companies may use the cost-of-capital methodology. This approach establishes the cost of holding sufficient capital to ensure the coverage of all future relevant non-financial risks. For European insurers this technique may be appealing since it is the one currently used for the purpose of calculating the Risk Margin in Solvency II.

[17] Klugman et al (2012), Loss Models – From data to decisions, p. 40

The Risk Margin is included in the technical provisions to ensure that their value can be regarded as equivalent to the amount that insurance or reinsurance undertaking would be expected to require in order to taking over and meeting the underlying obligations[18]. Its calculation is based on a transfer scenario, meaning that is assumed that all responsibilities of the original undertaking are taken over by a reference undertaking. In light of the Risk Margins' concept, its comparison to the RA may be limited, as in IFRS 17 this is seen as an entity-specific adjustment. Consequently, even if both may be materialized in the same measurement technique, they represent different concepts, and so the usage of Solvency II's inputs may be jeopardized.

Within the context of the Cost-of-Capital technique, the capital amount that ensures the coverage of all future relevant risks must be clearly identified, with Solvency II defining it as the sum of all future SCRs. Entities may use this as the basis for the RA, however the appropriate reassessments should be considered, especially concerning the risks to be included. In fact some of the relevant risks may not coincide, such as general operational risk, which is explicitly excluded from the RA and included under the Risk Margin.

Additionally, entities must determine a Cost-of-Capital (CoC) rate, which determines the cost of providing the required capital amount. Under Solvency II this rate is fixed by EIOPA at 6%. It is the same for all insurance and reinsurance undertakings, and defined based on the cost of providing eligible own funds for a BBB-rated insurance company. Moreover, it is assumed that 80% of the capital requirements can be funded by raising equity capital and 20% from issuing debt. Finally a 35% tax rate is considered for all jurisdictions. Given all these assumptions, it is unlikely that if entities perform an assessment of their own CoC rate, for IFRS 17 purposes, this would result in the 6% rate that is being used for prudential purposes.

Finally, in its most simplified calculation method, the Risk Margin may be calculated as fixed percentage of the BE, for which the same 6% CoC rate is used as the proportionality factor. Consequently, an identical approach may be used for the RA, with the due revisions, especially in what concerns the CoC rate and the capital amount. Moreover, while using Solvency II techniques as reference, entities may include the same factor to reflect the maturity and run-off pattern of liabilities- the modified duration[19]- which is taken into account to simplify the calculation of the capital charge from its most complex form, where all future SCRs must be considered, to the current value of the BE.

[18] Article 77(3), DIRECTIVE 2009/138/EC of the European Parliament and of the Council, 25 November 2009.

[19] The modified duration is a measure of the sensitivity of liabilities to changes in the interest rates.

4. Measurement and accounting of insurance contracts under IFRS 17

The two previous chapters developed an analysis on the two components, the discount rates and the RA, that together with the expected value of future cash flows, allow to determine the fulfilment cash flows. The appropriate measurement of this element becomes important to ascertain the Contractual Service Margin (CSM). This represents the expected future profit to be received due to insurance coverage.

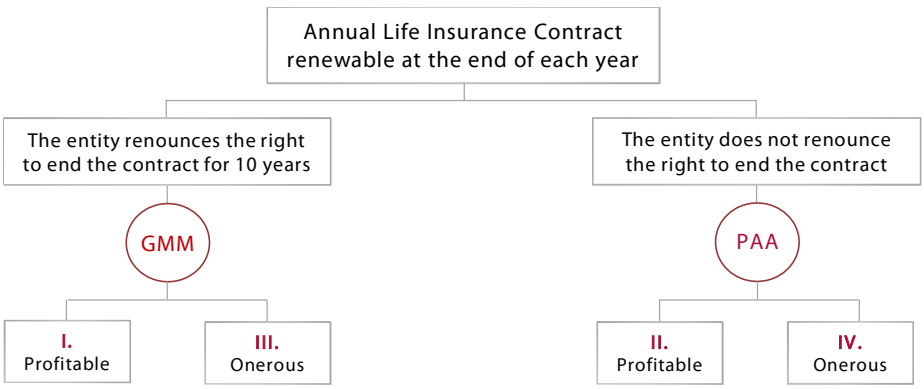
Whereas the CSM plays a fundamental role within the General Measurement Model (GMM), under the alternative accounting model, the premium allocation approach (PAA), this component ceases to exist. Consequently, if contracts are eligible to be accounted under the latter, the amount of insurance liability that must be constituted, at initial recognition, equals to the amount of expected cash inflows.

Given the coexistence of two models[20], a more extensive explanation of both is developed in this chapter, as well as the differences that may emerge on the insurer's results given dissimilar measurements of contracts. This assessment is complemented with an illustration of both a profit and loss making contract, according to each approach. Finally, a discussion is developed on IFRS 17 principles on contract boundaries, and the impact that these may have on the eligibility of the measurement model.

In order to achieve the comparability of the two available approaches, the same example is carried throughout the chapter, with due changes in its assumptions in each section. Figure 14, presents the structure of these illustrations such that the current analysis is easily understood.

This chapter, which falls mostly on the accounting aspects of IFRS 17, enhances the importance of actuaries to dominate some of these competences, including a deeper understanding on the recognition of insurance profits and losses. On top of their specific technical knowledge, their area of expertise will have to fall in a qualitative understanding of the business, both on a management and accounting perspective.

Figure 14 - Structure of the chapter's illustrative examples



[20] In the present assessment only the GMM and PAA are analyzed, however is important to emphasise that IFRS 17 provides requirements for a third approach, the Variable Fee Approach (VFA), which is designated to measure contracts with direct participating features.

4.1. Definition of Contract Boundaries

Under IFRS 17, the cash flows arising from insurance contracts should be considered within its boundaries as they arise from substantive rights and obligations that exist during the reporting period.[21] Consequently, if the entity has the right to force the payment of premiums from the policyholders or the obligation to provide them with services, the underlying cash flows should be taken into account when measuring the group of contracts.

However, under the Portuguese regulation for insurance contracts[22], is not allowed for a contract to come in force before a premium is paid by the policyholder, which causes the date of the beginning of the coverage period to coincide, or be posterior, to the date of the first payment made by the policyholder.

The abovementioned obligations towards the policyholders cease to exist as the entity is able to refuse the payment of the premiums or is able to reprice them reflecting the true underlying risks. Consequently, the moment in which one of the two occur, defines the end of the coverage period.

4.2. Profitable group of contracts

4.2.1. Requirements under the General Measurement Model for a Profitable Group of Contracts

Given the definition of contracts boundaries under IFRS 17, together with the national law, entities must calculate the fulfilment cash flows of a group of insurance contracts taking into account the cash flows that fall within these boundaries.

If the considered cash inflows outgrow the cash outflows, and after the consideration of the time value of money, financial and non-financial risks the result remains positive, than a CSM must be recognized. This translates to raising a liability by the same amount as the previously mentioned difference, ensuring that no day-one profits are acknowledged.

At the end of each reporting date, (IFRS 17, paragraph 44) the carrying of the CSM must be adjusted by the following:

(a) The effect of any new contracts added to the group.
(b) Interest accreted on the carrying amount of the contractual service margin during the reporting period.
(c) The changes in fulfilment cash flows relating to future service.
(d) The effect of any currency exchange differences on the contractual service margin.
(e) The amount recognized as insurance revenue because of the transfer of services in the period, determined by the allocation of the CSM.

The interest accreted and the changes in the fulfillment cash flows in each reporting period should be measured using locked-in rates, meaning the discount rates used on the first measurement of insurance contracts. This is justified by the fact that the CSM does not represent future cash flows. It represents, instead, the unearned profit in the contract, measured at the point of initial recognition and adjusted only for specified amounts.[23]

[21] IFRS 17 Insurance Contracts, paragraph 34
[22] Decreto-Lei n.º 72/2008 - Diário da República n.º 75/2008, Série I de 2008-04-16, article 59º.
[23] IFRS 17 Basis for Conclusions, paragraph BC274

Consequently, the usage of locked-in rates, together with the previous adjustments, assures that the total insurance service result recognized during the coverage period is equal to the difference between the premiums received and the actual claims and expenses incurred. Accordingly, the effect of the passage of time and changes in financial assumptions, not included in the CSM, must be recognized under the insurance financial result.

Given the described procedure for calculating the CSM, it is important to acknowledge that this amount, both on initial recognition and subsequent measurements, must never be negative. Consequently, if the estimates of the fulfilment cash flows result in a net outflow, these must be recognized as a loss component, a case which is further discussed in section 4.3 of the present chapter.

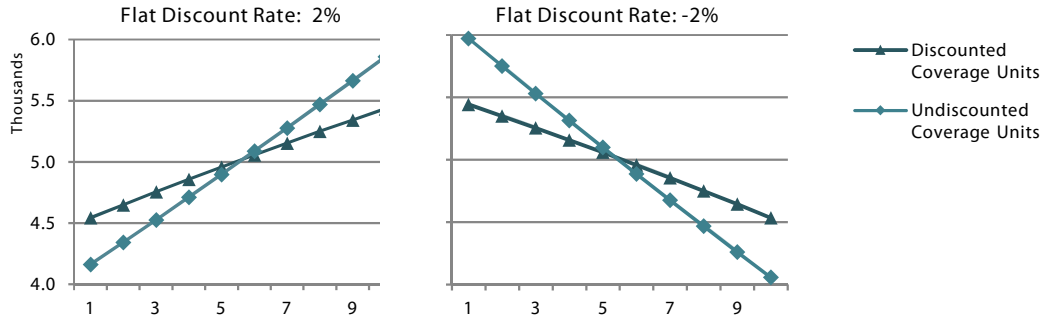
Furthermore, the requirements under IFRS 17 on profit recognition are based on the assumption that entities provide their services during the whole coverage period, and not only when claims are incurred. Consequently, in order for the CSM to be released as services are provided, IFRS 17 introduces the concept of coverage units.

The number of coverage units, as explained in paragraph B119 (a), is the quantity of coverage provided by the contracts in the group, determined by considering for each contract the quantity of benefits provided and its expected coverage duration.

Consequently, in order to define the CSM amount that should be allocated to insurance revenue, at each reporting date, entities must determine the coverage units that correspond to the period relatively to the ones expected to be provided in the future.

For the calculation of the number of coverage units, IFRS 17 does not specify if this should take into account the time value of money, leaving this aspect to the entity's own judgement. The consideration of this component certainly does not affect the total amount to be recognized in insurance revenue, however, it affects the pattern of release of the CSM. If entities choose to take into account the time value of money, that will result in smoother results that when this effect is not considered, as shown in figure 15.

Figure 15 - Comparison between the CSM allocations with coverage units discounted and not discounted



I. Illustrative example of the measurement of a Profitable Group of Contracts under the GMM

In order to illustrate the measurement of insurance contracts under the GMM, the following example is considered:

- Yearly renewable life insurance contract
- The entity renounces the right to end the contract for a period of 10 years.
- The group is composed of 1 000 contracts, with the same number of males and females, all with 45 years old in the beginning of the contract.
- Annual premium of 100 € (euros).
- Death benefit of 12.000 €.

Under the assumed group of contracts, the entity renounced the right to end the contract, and so, it's responsibilities towards the policyholders extend for the whole ten years. Given the definition of contracts boundaries previously stated, this forces the projection of the expected future cash flows for the entire renouncing period.

In order to perform the projection, and subsequently obtain the fulfillment cash flows, the following assumptions are made:

- The probability of surrender is 6%.
- The mortality table considered is the GKM/F 80.
- The entity is expected to have other expenses on this group of contracts corresponding to 15% of the premiums charged.
- The discount rates used are the ones obtained under chapter 3, using the TD and adjusted by the average CDS historical price of the instruments which compose the representative portfolio of Portuguese investments.
- The RA is considered proportional to the expected present value of future cash flows with a proportionally factor of 5%.

Subsequently, the expected present value of future cash flows is estimated (details can be found in Appendix A.3), and after the consideration of the RA, the final amount of the fulfilment cash flows along with the CSM on initial recognition is obtained, as shown in table 1.

Table 1 - Fulfillment Cash Flows and CSM (Euros)

Expected Present Value of Cash Inflow	752.891
Expected Present Value of Cash Outflow	496.801
RA	12.805
CSM	243.286

Given the obtained results, the entity is expected to earn 243.286 € over the following 10 years. Notwithstanding the fact that CSM should reflect the unbiased estimate of future cash flows, if entities are more or less prudent on their calculations, and thus, assume lower or higher future profits, that may be interpreted by the readers of the financial statements as a more or less valuable business. For instance, if the entity had assumed the death probabilities 15% lower, this would result in a 23% increase of the unearned profits.

Another important issue to be addressed by entities respects the amount of the RA. If these are more prudent, and assume a higher RA, that will translate in lower expected future profits at inception. However, if the non-financial risks are not materialized along the coverage period, these will be reflected as a gain in the financial statements, as an opposite of a loss if such risks are underestimated.

At the end of each reporting period, given the real experience, the CSM must be adjusted in order to accommodate the changes in the fulfillment cash flows. In this example, because the reality does not deviate considerably from the assumptions initially made, both probabilities of death and surrender

remain constant during the ten years. Thus, the only change in the fulfilment cash flows relates to the number of contracts in the beginning of the year given the real number of exists in the previous one.

Considering the time value of money for calculation of the number of coverage units, and taking into account the yearly adjustments just mentioned, the CSM release during the ten years of the coverage period are presented in table 2.

Table 2 - CSM Release (Euros)

	1	2	3	4	5	6	7	8	9	10
Opening Balance	243.286	224.585	191.338	167.783	144.655	120.149	96.265	72.102	48.227	24.168
Interest Accretion	-	(606)	(258)	17	172	203	254	178	91	26
Changes in the Fulfilment Cash Flows	5.448	(8.934)	91	501	(994)	(209)	(510)	(17)	(14)	-
CSM Release	**24.149**	**23.707**	**23.389**	**23.646**	**23.683**	**23.877**	**23.907**	**24.035**	**24.136**	**24.195**
Closing Balance	224.585	191.338	167.783	144.655	120.149	96.265	72.102	48.227	24.168	-

According to the previously obtain CSM release pattern, in each reporting period, the corresponding amounts must be allocated to insurance revenue along with the yearly relief of the non-financial risks, which is assumed to be linear on time. On top of these, the expected claims and expenses during the period are recognized under insurance revenue, reflecting the decrease in the liability of remaining coverage. The statement of comprehensive income until the run-off of the group of contracts is presented in table 3.

Table 3 - Statement of comprehensive income for profitable contract under the GMM (Euros)

	1	2	3	4	5	6	7	8	9	10
CSM Release	24.149	23.707	23.389	23.646	23.683	23.877	23.907	24.035	24.136	24.195
Change in RA	1.280	1.280	1.280	1.280	1.280	1.280	1.280	1.280	1.280	1.280
Expected Claims and Expenses	48.232	47.784	47.822	48.244	48.984	48.713	48.966	48.295	48.839	49.193
Insurance Revenue	**73.661**	**72.772**	**72.491**	**73.171**	**73.947**	**73.870**	**74.154**	**73.611**	**74.255**	**74.668**
Actual Claims	34.985	49.980	61.554	35.581	46.363	35.208	42.951	45.446	31.166	32.540
Insurance Service Expenses	**34.985**	**49.980**	**61.554**	**35.581**	**46.363**	**35.208**	**42.951**	**45.446**	**31.166**	**32.540**
Insurance Service Result	**38.676**	**22.792**	**10.937**	**37.590**	**27.585**	**38.662**	**31.202**	**28.165**	**43.089**	**42.128**

Considering all the unfavorable changes in the fulfillment cash flows, these are not sufficient to lower the CSM to zero. Consequently, the carrying amount of the CSM can be seen as a buffer that absorbs losses against an overestimation of the fulfilment cash flows.

If the expenses actually incurred do not deviate from the expected in the beginning of each period, then the insurance service result would be equal to the allocated CSM (not considering the effect of the RA). However, due to the fact that the two diverged, the results either exceed or fall below the allocated unearned profit. The volatility of the results will depend on these differences, reflecting the importance of accurate estimates of the fulfillment cash flows.

4.2.2. Requirements under the Premium Allocation Approach for a profitable group on insurance contracts

IFRS 17 provides an alternative accounting model to the GMM, the PAA, which can be eligible if the following requirements are met:

(a) The measurement of the liability of remaining coverage does not deviate materially from its measurement under the GMM (this requirement is not met if the entity is expecting high variability of the fulfillment cash flows).
(b) The coverage period in each contract within a group is one year or less.

Consequently, if the eligibility criteria are met, entities may evaluate their LRC as the amount of premiums received at inception, and in subsequent measurements this liability is adjusted for the premiums received during the reporting period.

This alternative accounting model comes as simplification of the GMM, as entities are not required to calculate the CSM and the RA as part of their LRC. Moreover, and because the coverage period is less than one year, the time value of money does not need to be taken into account.

At each reporting date the entity shall allocate the expected premiums to be received in insurance revenue on the basis of passage of time, or of the expected timing of incurred service expenses, if the latter differ from the passage of time[24]. Consequently, the insurance service result becomes the difference between the expected premiums to be received and the actual claims incurred.

II. Illustrative example of the measurement of a Profitable Group of Contracts under the PAA

In this section, to compare the measurement of insurance contracts between the two accounting models, the same example as in section 4.2.1 is analyzed, with the particularity that the entity does not renounce the right to end the contract.

Due to this change in the assumptions, the coverage period of the contracts becomes of one year since the entity's obligations towards the policyholders solely respect to this time length. Therefore, and in the light of IFRS 17 requirements on contract boundaries, the non-renouncement of the right to end the contract allows simplifying the measurement of the insurance contracts according to the PAA.

Consequently, the entity includes under the LRC the premiums received, not being required to discount them or to include the RA. In this example all cash inflows are assumed to be received in the beginning of the each period, and so no further adjustments are made to this component during the reporting period. Consequently, in the end of each year the carrying amount of the LRC is lowered to zero.

Considering that the real experience is exactly the same for both examples, ten years of the statement of comprehensive income is presented in table 4, assuming that the entity renews the yearly contracts. The results show that, each year, the total carrying amount of the LRC (the premiums received) is considered as part of the insurance revenue. This is justified by the fact that, as previously stated, the premiums are received in the beginning of the year and the evaluation of the insurance service result is made only in the end of the year.

[24] IFRS 17 Insurance Contracts, paragraph B126

Table 4 - Statement of Comprehensive Income for profitable contract under the PAA (Euros)

	1	2	3	4	5	6	7	8	9	10
Expected Premiums	100.000	92.500	86.200	80.800	76.100	70.000	65.100	59.300	55.300	51.300
Insurance Revenue	**100.000**	**92.500**	**86.200**	**80.800**	**76.100**	**70.000**	**65.100**	**59.300**	**55.300**	**51.300**
Actual Claims	34.985	49.980	61.554	35.581	46.363	35.208	42.951	45.446	31.166	32.540
Insurance Service Expenses	**34.985**	**49.980**	**61.554**	**35.581**	**46.363**	**35.208**	**42.951**	**45.446**	**31.166**	**32.540**
Insurance Service Result	**65.015**	**42.520**	**24.646**	**45.219**	**29.737**	**34.792**	**22.149**	**13.854**	**24.134**	**18.760**

When using the PAA, despite measuring the contracts on a yearly basis, entities may have their own expectations regarding future profits. Under this example, the prospects of the entity that didn't renounced to its rights and the one that did are exactly the same, since it is the same product and underlying assumptions. However, contrarily to the entity using the GMM, these are not disclosed under the financial statements.

On the one hand, the non-disclosure of future expectations may be beneficial as unfavorable changes in these are not reflected in the reporting figures. In fact, given its initial assumptions, the entity expected to receive the premiums equivalent to approximately 938 contracts. However, given the real experience it only receives the correspondent to 925. Despite the negative change on the cash inflows, these have no influence on the entities reporting figures.

On the other hand, and despite the total final profit being the same under both examples, being equal to the difference between the premiums charged and the expenses incurred, the entity that renounced to its rights and uses the GMM may appear more valuable to the readers of the financial statements. In fact, from the moment that the contracts are first measured, the latter discloses ten years' worth of future profits, while the entity using the PAA only reports the results on a yearly basis.

4.3. Onerous group of contracts

4.3.1. Requirements on IFRS 17 for the measurement of an Onerous Group of Contracts under the GMM

While in the previous sections an analysis was developed on the treatment of insurance contracts when the fulfillment cash flows result in a net inflow, in the following ones the requirements on IFRS 17 for the accounting of onerous contracts are discussed.

Under the GMM, on initial recognition, if the outcome of the fulfillment cash flows represents a net outflow it is required, on top of a null CSM, the establishment of a Loss Component as part of the LRC (equal to the negative amount). The introduction of this component allows entities to keep track of the onerous contracts against increases or reversals, in subsequent measurements, of total loss amount.

Furthermore, if rather than at inception, but in subsequent measurements, unfavorable changes in the fulfillment cash flows result in a contract being loss-making, the CSM must be lowered to zero and, again, a loss component should be established by the amount in excess.

Either at inception or succeeding measurements, the entity must immediately recognize the estimated losses in the statement of comprehensive income, under the insurance service expenses.

III. Illustrative Example on the Measurement of an onerous group of contracts under the GMM

The same illustrative example as the one developed in section 4.2.1, is carried on in the present one, however in order to demonstrate the measurement of loss-making contracts according to the GMM, it is considered that the liabilities were initially underestimated and the contracts turn out to be onerous.

Consequently, at inception, due to the initial assumptions being unchanged, the fulfilment cash flows and the amount of CSM is the same as in example I. However, in the present one, the actual annual number of surrenders and deaths supersede the ones estimated in the start of the each year. Thus, at the end the reporting date, not only the number of contracts in the beginning of the following period are recalculated, given the actual number of exists, but the assumptions regarding both mortality and lapse risk are updated.

The CSM development during the ten years, as well as the Loss Component from the moment it is first recognized is presented in table 5.

Table 5 - CSM and Loss Component Development (Euros)

	1	2	3	4	5	6	7	8	9	10
Opening Balance	243.286	241.009	102.643	46.622						
Interest Accretion	-	(658)	(101)	(2)						
Changes in the Fulfilment Cash Flows	23.638	(123.230)	(48.386)	(52.920)						
CSM Release	25.915	14.479	7.534		-	-	-	-	-	-
Closing Balance	241.009	102.643	46.622		-	-	-	-	-	-
Excess Over CSM	-	-	-	(6.301)	-	-	-	-	-	-
Changes In loss Component					(7.500)	(3.799)	1.508	(784)	5.657	
Changes in Interest				(2.234)	(158)	(131)	73	(14)	72	
Loss Component				(8.535)	(16.192)	(20.122)	(18.541)	(19.338)	(13.609)	

In the second and third years the unfavorable changes in the fulfillment cash flows decrease considerably the carrying amount of the CSM. Yet, these negative changes do not outgrow the CSM balance.

In the fourth reporting period the reduction of the fulfillment cash flows exceeds the existing CSM balance. Thus, and remembering that the latter cannot fall below zero, a Loss Component is recognized by the amount in excess. The importance of keeping track of the loss is demonstrated, as further changes in the fulfillment cash flows lead to the decrease or increase of this component. However, and despite not being represented in the current example, if favorable changes in the fulfilment cash flows reverse the negative trend, and the contract turns out to be profitable, a CSM should be again established.

Given the CSM release and the emergence of a Loss Component, the statement of comprehensive income for the present example is shown in table 6.

Table 6 - Statement of Comprehensive Income for onerous contract under the GMM (Euros)

	1	2	3	4	5	6	7	8	9	10
CSM Release	25.915	14.479	7.534	-	-	-	-	-	-	-
Change in RA	1.280	1.280	1.280	1.280	1.280	1.280	1.280	1.280	1.280	1.280
Expected Claims and Expenses	48.232	49.266	56.802	62.695	70.626	70.175	68.762	67.089	64.806	56.126
Insurance Revenue	**75.427**	**65.025**	**65.616**	**63.976**	**71.906**	**71.455**	**70.042**	**68.369**	**66.086**	**57.407**
Actual Claims	59.562	72.640	110.277	105.511	92.414	67.688	78.337	43.647	31.196	53.021
Loss on Onerous Contracts	-	-	-	8.535	7.657	3.930	(1.581)	797	(5.729)	-
Insurance Service Expenses	**59.562**	**72.640**	**110.277**	**114.046**	**100.071**	**71.617**	**76.756**	**44.444**	**25.468**	**53.021**
Insurance Service Result	**15.866**	**(7.615)**	**(44.662)**	**(50.070)**	**(28.165)**	**(162)**	**(6.714)**	**23.925**	**40.619**	**4.386**

Due to the unfavorable changes in the fulfillment cash flows, the entity, on the forth reporting date, has to recognize a loss on onerous contracts as part of its insurance service expenses. Given further increases and decreases of the expected future cash flows, it can be seen that the Loss Component reflects these changes to the extent they reverse entirely such component.

Overall, just as in section 4.2.1, the entity on its first measurement expected to have 243.286 € worth of profits. However, in the present example, this group of contracts turn out to be onerous and, because the entity renounce the right to end the contract, has to support the costs over the ten years period, ultimately losing 52.593 €.

4.3.2. Requirements on IFRS 17 for the measurement of an Onerous Group of Contracts under the PAA

In the context of the PAA, at any time during the coverage period, if the entity considers that the group of contracts is onerous, the difference between the carrying amount of the LRC (premiums received) and the fulfillment cash flows, must be immediately recognized in the P&L. The quoted fulfillment cash flows must be calculated according to the requirements under the GMM, and so must include the RA. However, these do not need to be discounted if the LRC previously calculated did not take into consideration the time value of money.

IV. Illustrative Example on the Measurement of an onerous group of contracts under the PAA

Under the present section an illustrative example of the measurement of contracts under the PAA is developed. Consequently, once again is assumed that the entity does not renounce the right to end the contract being able, as a result, to measure the group of contracts on a yearly basis.

Despite the guidance previously mentioned of recognizing immediately in the P&L the expected loss amount, under the present analysis the insurance service result is only ascertained in the end of the reporting period. Consequently, at this date both the fulfillment cash flows and the carrying amount of the LRC equal to zero, as the coverage period of these contract is of one year. However, if the evaluation was performed monthly, for example, extra calculations would be necessary. The statement of comprehensive income obtained from the current example can be found in table 7.

Table 7 - Statement of comprehensive income for onerous contract under the PAA (Euros)

	1	2	3	4	5	6	7	8	9	10
Expected Premiums	100.000	92.100	84.000	76.400	68.000	60.500	54.400	47.500	42.000	36.800
Insurance Revenue	**100.000**	**92.100**	**84.000**	**76.400**	**68.000**	**60.500**	**54.400**	**47.500**	**42.000**	**36.800**
Actual Claims	59.562	72.640	110.277	105.511	92.414	67.688	78.337	43.647	31.196	53.021
Insurance Service Expenses	**59.562**	**72.640**	**110.277**	**105.511**	**92.414**	**67.688**	**78.337**	**43.647**	**31.196**	**53.021**
Insurance Service Result	**40.438**	**19.460**	**(26.277)**	**(29.111)**	**(24.414)**	**(7.188)**	**(23.937)**	**3.853**	**10.804**	**(16.221)**

In each year, the entity defines its insurance service result as the difference between the expected premiums to be received, which in this case equal to the ones actually received in the beginning of the period, and the actual claims and expenses. Consequently, from the third year onwards the reality shows that the premiums charged are unable to cover the claims and expenses incurred, and so the contracts become onerous. However in this case the entity has the right to not renew the contract and control the losses.

4.4. IFRS 17 principles on contract boundaries and their impact on the eligibility of the measurement model.

In the previous sections, examples were given on the measurement of insurance contracts according to two of IFRS 17's accounting models, the GMM and the PAA. All the assumptions underlying the examples were the same, except the non-renouncement of the right to end the contract, which dispute the possibility of, in section 4.2.2 and 4.3.2, the contract being measured under the PAA.

In fact, as the entity renounces the right to end the contract, has obligations towards the policyholders during the renouncement period; however the right to force the payment of premiums is only extended for one year as the policyholders may surrender the contract. Thus, the duration of the contract, within the period which was renounced by the entity, depends exclusively on the policyholder.

In the case that the entity does not renounce the right to end the contract, both rights and obligations underlying the insurance contract become of one year. This happens because, not only the policyholder may surrender the contract, but the insurer may, as well, refuse to renew it.

Consequently the entity's choice between renouncing or not its rights becomes decisive on whether the insurance contracts are measured according to the GMM or the PAA.

Within the context of profitable contracts, despite both models resulting in the same total profit, to the readers of the financial statements the entity that uses the GMM may seem more attractive due to the disclosure of ten years' worth of profits, as previously discussed. However, as the contract becomes onerous, and because the entity is forced to renew the contracts, has to recognize such losses until the end of the coverage period. Contrarily, the entity who did not renounce, may end the contract at each year, and subsequently control the total loss amount.

In table 8, the cumulative insurance service result per year is presented for both accounting models, considering the examples in which the contracts are onerous. From the third year onwards the entity

using the GMM has a cumulative loss, which cannot be stopped, and is aggravated each year, until inevitably losing 52.593 € in the end of tenth year.

Focusing on the entity which did not renounce to its rights, and uses the PAA, it can be seen that this exhibits, yearly, a better cumulative insurance result than the one using the GMM. Moreover, upon the negative results, this may choose not to renew the contracts, thus ceasing the underlying losses. In the limit, if it chooses to renew the contracts until the end of the tenth year, it will have exactly the same loss as the entity using the GMM.

Table 8 - Cumulative Insurance Service Result

	1	2	3	4	5	6	7	8	9	10
GMM	25.403	19.137	(26.133)	(86.482)	(114.647)	(114.809)	(121.523)	(97.598)	(56.979)	(52.593)
PAA	40.438	59.898	33.620	4.509	(19.904)	(27.092)	(51.029)	(47.176)	(36.372)	(52.593)

Overall, and despite the idea that the entity using the GMM has a preferable product, when the group of insurance contracts is onerous it becomes clear that renouncing to a right will never turn out to be advantageous, at the limit it gives the two entities the same final result.

In fact, as IFRS 17 requires the limit of the contract to depend unilaterally on the possibility of the insurer to end the contracts, the numbers disclosed under the financial statements of the entity using the GMM may give a misleading picture. However if this boundary was defined on the policyholder's perspective all the differences would not have emerged, as both contracts would have been measured under the PAA.

The previous discussion becomes especially relevant within the Portuguese reality, as it is currently required for entities to recognize a contract during the period of time which the entity has obligations that emerged from the payment of the premium. Thus, the national perspective on contract boundaries would assure, within the established examples, the consistent accounting of the group of contracts. However, the adoption of IFRS 17 changes ongoing practices, and the illustrations under this chapter reflect some of the implications underlying these new requirements.

5. Conclusions

The current research provided important insights on IFRS 17, mostly on its macro level impacts, as well as the robustness of a principles-based setup on the potential achievement of the standard's goals. The opportunity of doing this research through an internship at ASF, within a team applying an ongoing effort towards its implementation, provided a helpful context.

Within the Portuguese reality, the accommodation of the new standard's principles on to PCES, involves a significant adjustment to some of the current practices. The need to calculate insurance liabilities on a forward-looking perspective, with a further analysis of the exposure to non-financial risks, contrasts with existing requirements.

Intended for the investigation of the discount rates, the same insurance contracts and underlying cash flows were kept constant across different jurisdictions, however allowing for variety on IFRS 17 specific components. This favored the understanding of the heterogeneous practices conceivable to arise due to the scope for individual assessment permitted by the standard.

The starting point of both the BU and TD approaches was identified as the component having the most prominent impact on the present value of cash flows. Particularly, in the case of the risk-free term structure, the US curve exceeded a 2% rate over all maturities, whereas the one relevant for PT- the return on the AAA-rated Euro Area Central Government Bonds - presented negative yields until the 9th year and the maximum value was 0,7%. Furthermore, the contrasting returns on the reference portfolios of investments were explained by the type and issuer country of the instruments composing them. The average US and PT return on the portfolio over the thirty years maturity was 3,5% and 1,6%, respectively, showing the magnitude of these differences.

In the context of the BU, the IA was calculated on the basis of the policyholders' probability of surrender, not being country-specific. This common upward adjustment to different risk-free term structures implied the present value of cash flows to vary significantly across jurisdictions. In fact, the US average was almost half of the PT/EU one, showing how carefully these results should be interpreted under the financial statements.

Under the TD, as the entities' prudence levels were assessed, the magnitude of its impact was explained by the contrasting quality and price volatility of the assets composing the reference portfolio of investments. In fact, the highest historical probability of default extracted from the PT portfolio was 20.36%, while from the JP was only 1.37%. Considering that the two have similarly low yield curves, the downward adjustment becomes an important source of disparities.

The challenges imposed by IFRS 17 are not only noticeable across different jurisdictions, but also within the same country. The comparison of the provision amount discounted with the four obtained yield curves relevant for Portugal exposed these inconsistencies. In the most extreme cases, the entity using the yield curve with a lower prudence level under the TD has an average discounted cash flow 22% lower than the entity which uses the flat discount rate under the BU.

Bearing in mind that the discounted value of the future expected cash flows is comprised under the CSM, this assessment shows how different interpretations and materializations of the same requirements have an influence on the amount assumed by entities as future profits. Consequently, if the methodologies used are overlooked, the comparison of the reported amounts may be misjudged.

The new standard requires the inclusion of the RA under the fulfillment cash flows to provide useful information on the non-financial risks assumed by entities. Considering that the comparison metric is the confidence level to which the RA corresponds, however exact confidence level is not specified, this questions the utility of its disclosure. Moreover, being entity-specific, imposes challenges on the consistency of the reported amounts due to the materialization of the same adjustment in conceptually different techniques. Both techniques explored under this report - the VaR and the Cost-of-Capital technique - under IFRS 17's framework are seen as interchangeable alternatives to each other. However, these represent distinct notions, since the former is a risk measure of potential loss events, while the Cost-of-Capital is more connected with the cost of holding the necessary capital amount to support the relevant risks. Thus, the direct comparison of the two is limited.

Additionally, the capital amounts previously quoted for the Cost-of-capital methodology may rely on the capital charges imposed by the relevant prudential regime, due to its natural association and objective similarity. This implies a RA dependent on the regulatory framework, contrasting with a business-specific adjustment in the case of the VaR.

Moreover the volatility, or need for recalibration, of the aforementioned techniques is dependent on different factors. For instance, the VaR calculated under the loss distribution of a motor line of business is not as linked to financial risks and considerations as the Cost-of-Capital technique, since the latter is subject to the Cost-of-Capital rates and discount rates. Thus, reassessments of the RA seem fair to consider approach-dependent, and along the coverage period it must be carefully interpreted by the readers of the financial statements.

Yet, the discussions developed throughout the report also reflect the challenges that would arise from a more prescriptive standard. In this type of regime the overall features of entities must be accommodated within the same framework, implying the definition of important judgements about the sector. However, it is predetermined the existence of deviations between the assumptions made and the entities' reality. The magnitude of these differences decides the suitability of the regime to reflect the underlying businesses.

Within the international context of IFRS 17, which must be adopted in jurisdictions with contrasting economic backgrounds and insurance businesses, the definition of a prescriptive standard could be the source of an *unlevel playing field*. The definition of a global mechanism to ascertain discount rates would impose complex challenges and likely imply deficient recognition of some of the individual features of jurisdictions. On the other hand, the characteristics and risks underlying the distinctive types of products would hardly be optimally satisfied using the same technique for the RA. Thus, by allowing scope for expert judgment, even if jeopardizes its comparability goals, it becomes more adaptable to different realities and allows for these adjustments to be customized to the entities' own business. This also implies the judgements on the underlying assumptions being responsibility of markets participants, such as investors, auditors and supervisors, rather than of a single statutory entity.

The analysis underlying the two components, the discount rates and RA, was complemented with the possibility of leveraging on Solvency II's techniques, due to the possibility of European insures taking advantage of already in force systems or operational procedures. They may want to take advantage from some of its inputs, such as the EIOPA risk-free term structure, or the Cost-of-Capital rate for the calculation of the RA. However, this is not straightforward, as SII is a prudential regime, with more prescriptive principles, and where most of the underlying assumptions are to accommodate the overall

features of insurers across Europe. As discussed within the 6% Cost-of-Capital rate for the calculation of the Risk Margin, this comprises a number of assumptions which are unlikely to reflect individual business profiles. Therefore, as the principles underlying the prudential regime are not entity-specific, they, by design, do not reflect insurer's own characteristics, management choices and risk perception, which is essential within IFRS 17 framework.

Finally, in order to understand how the reported figures are ascertained and if these are able to meet IFRS 17's goal of providing useful information's to the readers of financial statements, insights on the measurement and accounting of both profitable and onerous contracts were searched for.

It is demonstrated that the GMM allows for the recognition of profits in a timely manner by the inclusion of the CSM. This allows the clear understanding of the entities' expectations, and changes on those expectations. Nonetheless, the example considered of a yearly renewable life insurance product, showed that the information provided through the CSM may be, in specific situations, misleading.

Within the provided illustrations, by renouncing the right to end the contract, and subsequent usage of the GMM, a company discloses ten years' worth of profits. This may be interpreted as a more valuable business than the one of an entity which uses the PAA, thus not constituting CSM, as a result to the non-renouncement of its rights. However, as the contract becomes onerous, the former has to support losses over the whole ten years, while the latter may, eventually, end the contract still with a cumulative profit. Thus, despite the information provided by the CSM, which may give the impression of a more attractive scenario for the entity using the GMM, this has the same, or higher, losses as the one that reports profits on a yearly basis.

Overall, IFRS 17 aims to capture the economic substance of insurance contracts and harmonize practices across jurisdictions. Because it must be implemented over 120 countries, it allows for some flexibility, such that the financial statements reflect the specific features of every entity's business. Yet, some of the requirements under the standard question the level to which they are able to meet the principles of comparability, transparency and consistency that are also aimed. Thus, besides insurers, all market participants, including investors, analysts and supervisors, must be educated in this direction such that the quality of the information is delivered.

A. Appendixes

A.1 Assumptions in the construction of reference portfolios of investments

Intended for the construction of the reference portfolios of investments relevant for each jurisdiction, the assumptions made follow the investigation developed on the investments representing at least 40% of the investment allocation of the insurers in the respecting countries. Given the proportions described in the following paragraphs, these are further calibrated to represent the entire portfolio of investments.

I. Portugal

Considering the information on the *Relatório do Sector Segurador* (2017), published by ASF, 31.6% of the total investment of the Portuguese insurance companies is allocated in domestic government bonds. On the other hand, from the concentrated investment in government bonds across the EU, representing 36.5% of the total investment in foreign bonds, 13% and 11.8% represents, respectively, Italian and Spanish sovereign bonds.

II. United States of America

According to the Chicago Fed Letter, *What do U.S. Life insurers invest in?*, from the Federal Reserve Bank of Chicago, on April 2013, 7.8% of the General Account (GA) assets of American life insurers are represented by Treasury Federal Bonds . Corporate bonds, on the other hand, account for 46.0% of all the general account invested assets. It is assumed that the total investment in corporate bonds is equally divided between the two biggest American banking groups, the Bank of America (BoA) and the JP Morgan and Chase (JP MC).

Additionally, and considering the some report, agency and non-agency MBS represent equally 7.4% of the total investment of life insurers. The representation of MBS on the representative portfolio of American insurers is assumed to be issued by the Federal National Mortgage Association.

III. Japan

In order to obtain the representative portfolio of Japanese investments the information on the Asia Pacific Insurance Survey (2017), Abardeen Standard Investments, is considered. From this it is extracted that 49% of the investment of Japanese insurers respects domestic government bonds, and 13% overseas government bonds. The latter, assumed to be from the United States.

IV. Australia

According to the previously mentioned survey, 30% of the asset allocation of Australian insurers relies on domestic government bonds. 16%, on the other hand, is allocated to domestic corporate bonds, for which the three most prominent banks in Australia are considered in the same proportion. These are, the Common Wealth Bank of Australia (CW BAUS), WestPac Banking Group (WP BG) and Australia and New Zealand Banking Group (AUSNZ BG). Finally, 10% respects to overseas government bonds, which are assumed to be equally from the United States of America and the United Kingdom due to their economic, political and historical influence with Australia.

A.2 Data for the construction of the yield curves

The yield curves and underlying instruments were extracted in a short timespan to ensure the comparability of economic circumstances. The vales highlighted in blue represent the linearly interpolated values given the missing data for those maturities. In the case of Italy, the yield on the 30-year maturity was interpolated from the 3.52% yield at 50-year maturity.

	①	②	③						
Time to Maturity	EIOPA Risk-Free Term Structure	AAA-Rated Euro Area Central Government Bonds	PT Government Bonds	US Government Bonds	JP Government Bonds	AU Government Bonds	SP Government Bonds	IT Government Bonds	UK Government Bonds
1	-0,33%	-0,59%	-0,35%	2,41%	-0,16%	1,57%	-0,33%	0,04%	0,66%
2	-0,29%	-0,59%	-0,30%	2,30%	-0,17%	1,48%	-0,28%	0,58%	0,62%
3	-0,24%	-0,55%	-0,16%	2,26%	-0,17%	1,43%	-0,20%	1,02%	0,63%
4	-0,17%	-0,49%	0,04%	2,29%	-0,18%	1,44%	-0,06%	1,25%	0,68%
5	-0,09%	-0,40%	0,17%	2,31%	-0,17%	1,51%	0,06%	1,54%	0,74%
6	0,00%	-0,31%	0,55%	2,34%	-0,18%	1,60%	0,41%	1,83%	0,76%
7	0,10%	-0,21%	0,76%	2,37%	-0,17%	1,69%	0,63%	2,09%	0,82%
8	0,19%	-0,12%	0,93%	2,40%	-0,16%	1,77%	0,82%	2,11%	0,90%
9	0,29%	-0,03%	1,14%	2,42%	-0,10%	1,83%	0,95%	2,36%	0,88%
10	0,38%	0,05%	1,26%	2,44%	-0,05%	1,87%	1,12%	2,55%	1,00%
11	0,46%	0,12%	1,26%	2,46%	-0,01%	1,88%	1,12%	2,55%	1,05%
12	0,54%	0,19%	1,36%	2,48%	0,03%	1,89%	1,21%	2,63%	1,11%
13	0,62%	0,25%	1,46%	2,50%	0,08%	1,93%	1,30%	2,71%	1,18%
14	0,69%	0,31%	1,55%	2,52%	0,12%	1,97%	1,39%	2,79%	1,25%
15	0,74%	0,36%	1,75%	2,55%	0,17%	2,01%	1,57%	2,96%	1,33%
16	0,78%	0,41%	1,80%	2,57%	0,20%	2,06%	1,60%	3,02%	1,36%
17	0,81%	0,45%	1,85%	2,59%	0,24%	2,12%	1,64%	3,09%	1,38%
18	0,84%	0,48%	1,90%	2,61%	0,28%	2,17%	1,67%	3,16%	1,41%
19	0,87%	0,52%	1,95%	2,63%	0,31%	2,23%	1,70%	3,22%	1,44%
20	0,91%	0,55%	2,01%	2,65%	0,35%	2,28%	1,74%	3,29%	1,47%
21	0,96%	0,57%	2,27%	2,68%	0,37%	2,30%	1,81%	3,34%	1,48%
22	1,02%	0,60%	2,54%	2,70%	0,39%	2,32%	1,88%	3,38%	1,50%
23	1,08%	0,62%	2,81%	2,72%	0,40%	2,34%	1,96%	3,42%	1,52%
24	1,15%	0,64%	3,08%	2,74%	0,42%	2,37%	2,03%	3,46%	1,53%
25	1,21%	0,66%	3,35%	2,76%	0,44%	2,39%	2,11%	3,51%	1,55%
26	1,28%	0,68%	3,61%	2,78%	0,46%	2,41%	2,14%	3,51%	1,55%
27	1,34%	0,70%	3,88%	2,81%	0,47%	2,43%	2,17%	3,51%	1,54%
28	1,41%	0,71%	4,15%	2,83%	0,49%	2,45%	2,21%	3,51%	1,54%
29	1,47%	0,73%	4,42%	2,85%	0,51%	2,47%	2,24%	3,51%	1,54%
30	1,54%	0,74%	2,34%	2,87%	0,53%	2,49%	2,27%	3,51%	1,54%

The yield curves for the corporate bonds were also linearly interpolated, despite only the data used for the basis of their construction being shown. The instruments considered were chosen in a pragmatic way, attempting to reflect their overall structure.

For the Bank of America yield curve, it is assumed that the return at 30-years maturity corresponds to the one of the perpetual callable bond. Because the data on MBS extends only until the tenth year of maturity, and given their relatively stable yields, the yield of the MBS is assumed to be constant over all maturities and equal to the average of the presented values.

④ Corporate Bonds

Bank of America

Years to Maturity	Rating	Type	Yield (in %)
1,5	A-	Callable	2,63
3,5	A-	Callable	3,19
5	A-	Callable	3,20
8	A-	Callable	3,30
10	A-	Callable	3,60
12	A-	Callable	4,24
15	A-	Callable	4,35
20	A-	Callable	5,09
Perpetual	BBB+	Callable	5,34

Common Wealth Bank of Australia

Years to Maturity	Rating	Type	Currency	Yield (in %)
3	AA-	Bullet	AUD	1,86
5	AA-	Bullet	AUD	2,20
10	AA-	Bullet	AUD	2,98
15	AA-	Bullet	AUD	3,30
30	AA-	Bullet	AUD	3,63

JP Morgan Chase

Years to Maturity	Rating	Type	Yield (in %)
2	AA-	Callable	2,75
3	AA-	Callable	2,81
5	AA-	Callable	3,06
10	A	Callable	3,28
11	A	Callable	3,63
21	A	Callable	3,95
31	A	Callable	4,09

Federal National Mortgage Association

Years to Maturity	Rating	Type	Yield (in %)
2	AA+	Bullet	2,32
3	AAA	Callable	2,65
3	AAA	Bullet	2,28
5	AAA	Callable	2,66
10	AA+	Bullet	2,54

WestPac Banking Group

Years to Maturity	Rating	Type	Currency	Yield (in %)
1	AA-	Bullet	GBP	0,86
2	AA-	Bullet	GBP	1,04
4	AA-	Bullet	USD	2,00
5	AA-	Bullet	USD	2,34
10	BBB+	Callable	USD	3,20
12	BBB+	Callable	USD	3,80
30	BBB+	Bullet	USD	4,62

Australia and New Zealand Banking Group

Years to Maturity	Rating	Type	Currency	Yield (in %)
1	AA-	Bullet	GBP	1,13
2	AA-	Bullet	GBP	1,35
3	AA-	Bullet	AUD	1,91
5	AA-	Bullet	AUD	2,28
8	AA-	Bullet	AUD	2,65
15	AA-	Bullet	AUD	3,31
30	NR	Callable	AUD	3,60

The highest, lowest and average of the historical 5-year CDS price for the PT, SP and IT government bonds correspond to the time period between 2009 until July 2018. In the case of the US corporate bonds, this ranges from the beginning of 2009 until May 2019. For the remaining instruments the time period extends from May 2007 to May 2019.

For the calculation of the probability of default, the recovery rate is considered to be 40%.

⑤ CDS 5 Years (Basis Points)

	PT	US	JP	AUS	SP	IT	BoA	JP MC	CW BAUS	WP BG	AUSNZ BG
Highest	1483,85	100	154,75	167,4	599,28	562,71	483,064	232,302	242,97	242,92	242,89
Lowest	46,52	5,8	2,3	11,907	38,99	60,91	36,24	11,45	5	37,37	5,5
Average	342,7	29,66	51,946	49,25	171,89	190,38	152,852	70,16	88,48	91,26	89,203

Probability of Default (in %)

	PT	US	JP	AUS	SP	IT	BoA	JP MC	CW BAUS	WP BG	AUSNZ BG
Highest	24,73	1,00	1,55	1,67	9,99	9,38	2,9	1,39	1,46	1,46	1,46
Lowest	0,78	0,06	0,02	0,12	0,65	1,02	0,22	0,11	0,03	0,22	0,03
Average	5,71	0,30	0,52	0,49	2,86	3,17	0,92	0,7	0,53	0,55	0,54

Data Sources:

① EIOPA risk-free term structure (March 2019) - URL: https://eiopa.europa.eu/regulation-supervision/insurance/solvency-ii-technical-information/risk-free-interest-rate-term-structures

② AAA Rated Euro Area Central Government Bonds (1st April 2019) - URL: https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/euro_area_yield_curves/html/index.en.html

③ Government Bonds for all Jurisdiction (3rd April 2019) - URL: http://www.worldgovernmentbonds.com/

④ BoA, JP MC, CW BAUS, WPBG, AUSNZ GB Bonds and FNMA MBS (30th Abril 2019)- Bloomberg

⑤ 5-year Historical CDS minimum, maximum and average - Bloomberg

A.3 Details on the estimation of number of coverage units and expected value of future cash flows at inception

I. Expected Present Value of Future Cash Flows

From the 1000 contracts assumed to exist in the beginning of the coverage period, the number of deaths and surrenders are calculated based on the probabilities assumed (stated in page 32). The total of contracts in the beginning of the following years is updated by the number of exits expected in the previous reporting period.

Given the number of contracts, surrenders and deaths expected to occur, and considering the annual premium per policyholder of 100€, a death benefit of 12.000€ and other expenses corresponding to 15% of the premiums charged, the future cash flows are projected. Finally these are discounted to the first year and the total expected present value of future cash flows, which is comprised under the fulfilment cash flows, is obtained by summing the present value of net cash flows, presented in the table, over all maturities.

Number of Expected Contracts and Exits per Year

	1	2	3	4	5	6	7	8	9	10
Nº of Contracts	1000,0	937,2	878,1	822,5	770,1	720,7	674,2	630,3	589,0	550,1
Nº of Surrenders	60,0	56,2	52,7	49,3	46,2	43,2	40,5	37,8	35,3	33,0
Nº of Deaths	2,8	2,9	3,0	3,1	3,2	3,3	3,4	3,5	3,6	3,7

Expected Future Cash Flows

	1	2	3	4	5	6	7	8	9	10
Premiums	100.000	93.723	87.813	82.248	77.007	72.070	67.418	63.034	58.903	55.009
Cash Inflows	**100.000**	**93.723**	**87.813**	**82.248**	**77.007**	**72.070**	**67.418**	**63.034**	**58.903**	**55.009**
Other Expenses	15.000	14.058	13.172	12.337	11.551	10.810	10.113	9.455	8.835	8.251
Deaths	33.232	34.358	35.545	36.772	38.016	39.343	40.597	41.881	43.185	44.498
Cash Outflows	**48.232**	**48.416**	**48.717**	**49.109**	**49.567**	**50.153**	**50.709**	**51.336**	**52.021**	**52.750**
Net Cash Flows	**51.768**	**45.307**	**39.096**	**33.140**	**27.440**	**21.917**	**16.709**	**11.698**	**6.882**	**2.260**
Present Value of Net Cash Flows	**51.768**	**45.438**	**39.275**	**33.286**	**27.505**	**21.891**	**16.571**	**11.496**	**6.692**	**2.170**

II. Number of Coverage units

To obtain the CSM release the quantity of coverage provided in each period must be calculated. This is obtained through the ratio between the quantity of benefits (cash outflows) expected to be provided during the remaining coverage period, and the quantity of benefits respecting each of the reporting dates

	1	2	3	4	5	6	7	8	9	10
Quantity of benefits (Discounted)	48.232	48.557	48.939	49.326	49.686	50.095	50.292	50.449	50.579	50.647
Cumulative quantity of benefits	496.801	448.568	400.012	351,073	301.747	252.062	201.967	151.675	101.226	50.647
Coverage Units corresponding to each period	**9,71%**	**10,82%**	**12,23%**	**14,05%**	**16,47%**	**19,87%**	**24,90%**	**33,26%**	**49,97%**	**100,00%**

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