LISBON SCHOOL OF ECONOMICS & MANAGEMENT
UNIVERSIDADE DE LISBOA

MASTER

ACTUARIAL SCIENCE

MASTER´S FINAL WORK

INTERNSHIP REPORT

UK'S PENSION PROTECTION FUND – IMPORTANCE AND FEATURES OF PPF VALUATIONS

BY MACIEJ JULIAN SKWIERCZYNSKI

DECEMBER - 2017

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Abstract

The aim of the following work is to describe my internship experience, with a focus on what I have learned about the Pension Protection Fund (PPF) and Section 179(S179) Actuarial Valuations. In order to describe the key features of the PPF, I will make comparisons to alternative protection systems that can be found around the world, with the main comparisons made to the Pension Benefit Guarantee Company which operates in the United States of America. As the two systems operate in two different markets the comparison will be limited by many assumptions necessary to make a comparison viable.

Keywords

Pension Protection Fund; PPF; Pension Benefit Guaranty Corporation; PBGC, pension schemes; Defined Benefits; Defined Contributions; Pension Fund protection; Actuarial valuation

Acknowledgments

I would like to thank Willis Towers Watson Lisbon Service Centre team who helped me during my internship to learn as much as possible about PPF valuations and all the support I received during my internship. I also want to recognise the support that was given to me by my professor from ISEG Fatima Pires Lima and my company supervisor Elizabeth Metcalfe.

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Glossary

DB – Defined Benefit pension – type of a pension scheme where the final benefits are calculated based on an agreed formula, which is known in advance. Contributions may vary to meet the value of the agreed benefits.

DC – Defined Contribution pension – type of a pension scheme where the contribution levels are defined, the benefits are calculated based on the contributions' accumulated value and prevailing market conditions at retirement date

PPF – Pension Protection Fund – UK defined benefit pension scheme protection scheme

PBGC – Pension Benefit Guarantee Company – US defined benefit pension scheme protection scheme

PSVaG – Pension-Sicherungs-Verein Versicherungsverein auf Gegenseitigkeit – German pension protection fund

RPI – Retail Price Index – UK specific statistical measure of inflation based on a basket of goods and services

CPI – Consumer Price Index – statistical measure of inflation based on a basket of goods

S179 – Section 179 valuation under PPF rules

Levy – amount of contributions paid in to PPF by member schemes each year

Deferred member – scheme member who isn't contributing anymore, but isn't pensioner yet

Dependant member – spouse or child of a deceased scheme member

Retiree member – member of a scheme that is receiving pension from the scheme

Introduction

During the fourth semester of my Actuarial Science Master course at ISEG I was an intern at Willis Towers Watson in Lisbon. The internship was 5 months long and I was exposed to many work areas that are present in the Lisbon office. Most of time I was working on UK Defined Benefit pension schemes actuarial valuations calculations. These valuations are required by the UK law to be carried out at least every 3 years by DB pension schemes and are a very important tool to assess how well the scheme is funded, i.e. are the current assets held by the scheme expected to be able to cover the expected future liabilities. Pension schemes are subject to formal requirements to conduct various actuarial valuations such as ongoing funding position, sensitivities to key assumptions or solvency position estimates. However, the part of the valuations that was of main interest to me was the PPF valuation, namely S179 PPF valuation.

PPF was set up by the UK government as a safety measure, to provide compensation in cases when an eligible DB pension scheme becomes insolvent. The insolvent scheme will then by transferred to PPF (unless it can buy out its liabilities with an insurance company in the open market). PPF then provides the members of the scheme with compensations, instead of the pensions they were receiving, or that they were promised (in case of deferred members). The compensation amounts are capped for deferred members and early retirees to limit the liabilities faced by the PPF. The maximum cap is set at £38,505.61[1] from 1st April 2017. There is also a multiplier applied to deferred and early retiree members, the multiplier is 90%, thus in these cases the maximum cap is £34,665.05[1]. If you consider the PPF as a

[1] Pension Protection Fund, Compensation [Online], Available from: http://www.pensionprotectionfund.org.uk/Pages/Compensation.aspx [Accessed 01/09/2017]

special case of a pension scheme, then it should also asses its own funding level. In this case it is crucial, as the PPF is the last “safety net” to protect scheme members.

Section 179 valuation is a special case of an actuarial valuation. Scheme’s participating in the PPF are required to undertake this special case of valuations in order to determine scheme’s funding position.

There is a special set of rules governing how a PPF valuation must be calculated to meet the legal requirements. Another key point to note is that S179 valuation only value the compensation which would be payable in the PPF, which is expected to differ to the normal scheme benefits. This means the results are not directly comparable to other valuations made for the same scheme, as the assumptions can differ significantly between them. This would imply that the key consideration to make when assessing how well PPF itself is funded and prepared for the future would be to consider the S179 assumptions, how realistic and how generous/stringent they are for the scheme members. I decided to compare the S179 valuation to what PBGC valuations assume, because PPF was set up in 2004 and is based on the experience of other protection funds, one of the oldest being PBGC (set up in 1974).

1. Pension protection

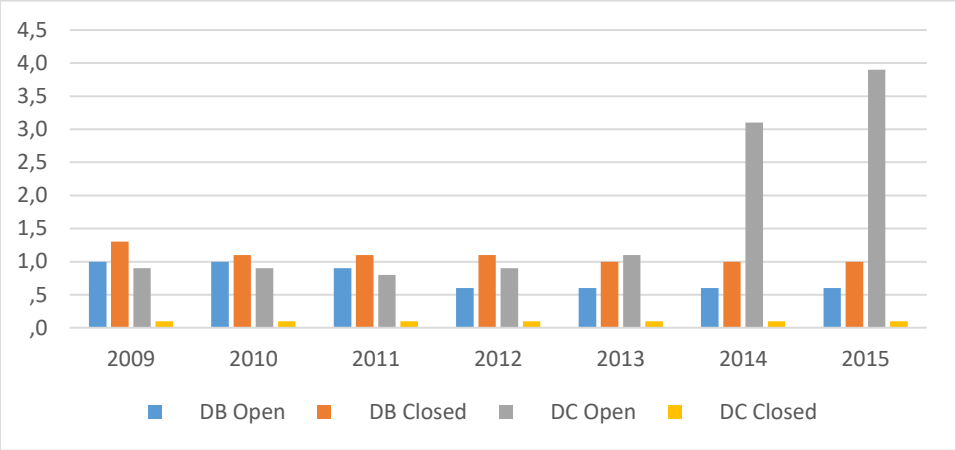

Figure 1 Active membership of private sector occupational pension schemes by status and benefit structure, 2009 to 2015[2]

Let us first consider why protection schemes are needed at all, to do that we must first consider the type of benefits that they protect and why they are so important.

Defined benefit (DB) (also referred to as final salary) pension plans are a type of a retirement scheme in which the sponsor (usually the employer) promises to pay a pension to the member on retirement, based on an agreed formula which calculates the benefits using a set of factors, such as employment length and salary history. Pensions are of key importance to peoples' welfare after retirement, where traditionally it has usually been their main source of income. There are however some concerns regarding the sustainability of the defined benefit model that lead to development of alternative options such as defined contribution schemes (DC) or hybrids of the two (e.g. defined contributions with a part that is guaranteed).

[2] Source: Office for National Statistics; Statistical bulletin: Occupational Pension Schemes Survey, UK: 2015, Available from: https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/pensionssavingsandinvestments/bulletins/occupationalpensionschemessurvey/uk2016 [Accessed 29/09/2017]

One of the main issues for the sponsor in a DB pension plan is that it assumes all the investment risk. This means that the sponsor takes on the obligation to pay a certain amount to scheme members on their retirement and to do so it should accumulate sufficient funds before retirement of scheme members to cover these costs. However, the funds that are accumulated over the years need to be invested in different investment options (stocks, assets, gilts etc.) in order to accumulate the necessary amount. Almost all investments bear some investment risks, such as company default risk, inflation exceeding the returns and others, which can lead to accumulated funds not being sufficient to cover the pensions value. If this is the case, the plan sponsor (the company that provides its employees with the DB pension) will be expected to cover the missing assets through additional contributions to the scheme. If the company is not in a strong financial position itself, it may be unable to make the necessary additional contributions to cover the deficit. This may lead to scheme's insolvency, which may leave the pensioners with lower than expected pensions, or in a worst-case scenario with no pensions at all.

This is obviously a big socio-economic risk that the UK government addressed by establishing the Pension Protection Fund in 2004. The key role of the PPF is to provide compensation to members of DB pension schemes that become insolvent. Its most important tool to achieve that is to assess the defined benefit schemes' funding position through S179 valuations and based on them gather levies that will be used by the Fund to take over insolvent schemes and provide compensation to their members. The word "compensation" meaning that the PPF will not simply take on the pension obligations of the insolvent schemes that come to it, instead it will limit the money received to a certain level in cases of deferred pensioners, or retirees with very high pensions. The idea behind these limitations is to lower

the liabilities taken on by the PPF, in order to make the PPF model sustainable, whilst aiming to provide the majority of members with sufficient retirement income to maintain an acceptable standard of living.

The compensation for deferred pensioners is subject to caps, the cap set from 1 April 2017 is £38,505.61 which after applying the 90% compensation multiplier equates to £34,665.05. The 90% multiplier is usually applied to early retirees and deferred scheme members, with the majority of retirees not having their retirement income significantly reduced. Ill-health retirees and dependants are also usually not subject to 90% multiplier (unless their pension is very high). To understand how the PPF levy rules aim to provide both sufficient funding and fair burden on the schemes, we must look at similar plans from which lessons were learned. The PPF was setup relatively recently compared to similar bodies in other countries, thus it aimed to learn from issues faced by counterparts in the US, Netherlands, Germany and others.

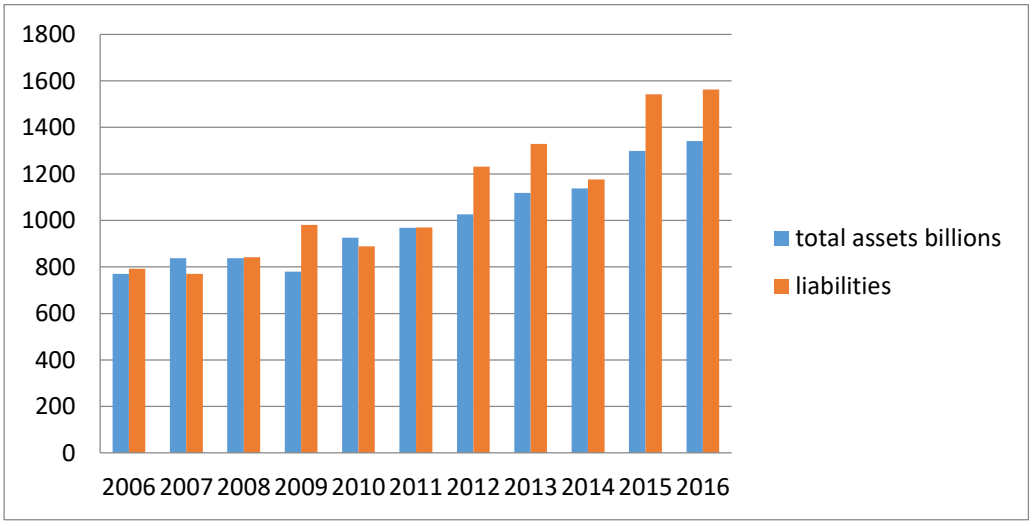

Figure 2 PPF Assets vs Liabilities (S179) (£ billions)[3]

[3] Source: Pension Protection Fund; PPF 7800 Index, 2006-2016, Available from: http://www.pensionprotectionfund.org.uk/Pages/PPF7800.aspx

1.1 PPF Levy – UK approach

The levy is the one of the main sources of funding for protection schemes, thus being of crucial importance to their failure or success. The levy is used to cover the potential gap between a failed scheme's liabilities and the assets that the PPF was able to recover from it. When setting up the levy structure, the PPF faced a couple of dilemmas. Other schemes chose alternatives; hence a comparison should be made of the outcomes. Taking PPF approach as a starting point, the pension fund levy consists of two components: scheme-based levy (SBL) and risk-based levy (RBL). (There is an administration levy that is set by the Department for Work and Pensions and covers PPF expenditures related to PPF assessment process and administration expenses. It is set per scheme member, but is of little interest in this discussion). The scheme-based levy is based on S179 valuation that the funds are required to perform at least once every three years. The formula is:

$$(1)\ SBL = 0.000021 * UL^{4},$$

where *UL* is "the scheme's liabilities on a S179 basis rolled forward to 31 March 2017 in a way prescribed by the PPF"[3] All schemes are obliged to pay the SBL, even if they are fully funded.

The risk based levy uses the following formula:

$$(2)\ RBL = U * IR * LSF^{4},$$

where:

[4] Pension Protection Fund (2017), How the Levy Works [Online], Available from: http://www.pensionprotectionfund.org.uk/levy/howthelevyworks/Pages/howthelevyworks.aspx

U is the underfunding amount of the scheme, less approved asset arrangements, deficit reduction contributions and certified asset backed contribution value;

IR – Insolvency Risk special factor assessed for the scheme by Experian, based on the previous levy year;

LSF - Levy Scaling Factor is the factor set by the scheme each year to scale the amount to match the levy estimate (0.65 for 2017/2018). The LSF can be adjusted by the PPF, in order to collect higher levies, to meet the funding requirements. Risk-based levy is subject to a cap, if the scheme's RBL exceeds 0.75% of unstressed liabilities, the cap is instead applied and RBL becomes $(3) RBL\ cap = UL * K$, where UL is unstressed liabilities and K is the cap (0.0075 for 2017/2018). We will discuss the levy structure further after the comparisons with other scheme's approaches. Later we will also consider multi-employer schemes and their levies.

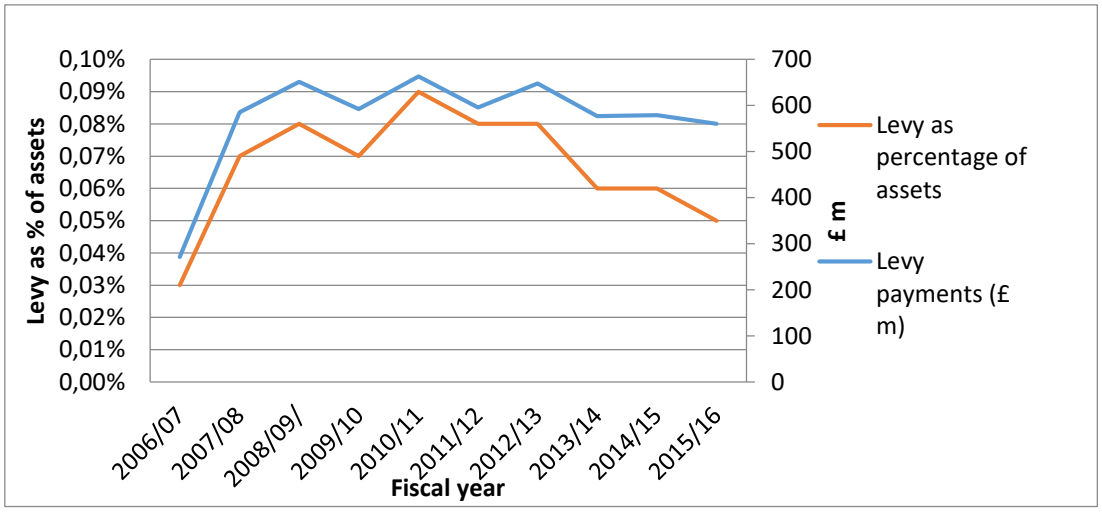

Figure 3 Levy payments and % of assets[5]

[5] Source: Pension Protection Fund, The Purple Book 2016 [Online], Available from: http://www.pensionprotectionfund.org.uk/Pages/ThePurpleBook.aspx [Accessed: 01/09/2017]

Consider the above graph to analyse the levy payments and their strain on the member schemes. Ignoring the 2006/2007 fiscal year levy amounts, we can see that the levy amount collected overall was reasonably stable and more importantly, the levy as percentage of assets indicator has been steadily decreasing since 2012/2013. That would indicate that the strain on the schemes overall is decreasing with time, which would back the idea that PPF over the longer term should not be the cause of schemes insolvencies.

1.2 PBGC – US approach

The US equivalent of PPF is PBGC. It was set up in 1974 to support members of DB pension plans whose company sponsor became insolvent. Similarly to the PPF, the compensation paid has a cap set by law for members retiring at normal retirement age (65 in US), or adjusted if retiring early/late. One notable difference is that there is no inflation adjustment allowed for, meaning that a member's pension loses purchasing power over the years. Similarly to the PPF, PBGC receives no funds from the government; instead collecting money from insurance premiums set by Congress and collected from eligible schemes. Other sources of income are investments and recoveries made. The fundamental difference between PBGC and PPF is how the Levy or "insurance premium" is set.

PBGC´s premium for single employer schemes consists of two parts: [6]

$$(3)\ PBGCPremium = 69 * No\ of\ participants + \frac{34}{1000} * UVB$$

[6] Source: Pension Benefit Guarantee Corporation, Premium Rates [Online], Available from: https://www.pbgc.gov/prac/prem/premium-rates

Flat rate of $69 per participant and Variable-Rate Premium (VRP) of $34 per $1000 of unfunded vested benefits (UVBs). The VRP is capped at

$$(4)\ VRPCap = \$517 * No\ of\ participants$$

However, it can be lowered for small employers (fewer than 25 employees). We should consider how this approach turned out for the PBGC over the years, given that we have a much longer history available here. Considering only the single employer schemes, the 2016 Annual Report states that the Single-Employer Financial Position "increases by $3,485 million, decreasing the program's deficit to $20,580 million."[7] It has $97,342 million assets against $117,922 assumed liabilities. The deficit faced by PBGC is a problem that has been present for many years and is not directly related only to the 2008 financial crisis. The 2007 financial position already had $13,111 million deficit, which almost doubled in 2009 to 21,594 million[7].

However, thanks to significant reforms in PBGC's levy structure, the 2015 fiscal year projections for single employer liabilities simulated over 10-year period are now more optimistic, indicating the potential to reach a net surplus over the next decade.

From 2013 onwards PBGC's premiums were reformed, the flat-rate premium is now partially inflation-linked to reflect time-value of money and the variable-rate premium now reflects the solvency risk of the sponsor, which should reflect the probability of the fund becoming insolvent in the future.

[7] Pension Benefit Guarantee Corporation, Annual Report 2016 [Online], Available from: https://www.pbgc.gov/documents/2016-Annual-Report.pdf

As we can observe on the graph, the yellow line is Premiums collected less benefits paid and expenses. The premium rates' escalation had been lagging behind benefits paid since 1998. One of the most important changes introduced in 2013 was the risk based levy. After the 2013 thorough reforms we see rapid closure of the gap between income and expenses. This suggests that the risk based levy (and overall increase in fixed rate levies) noticeably improved the condition of the fund. Even though the PBGC is not directly sponsored by the US government, the process of reforming the premiums was a political process which contributed to the slow response to the problem that started in the late 90s.

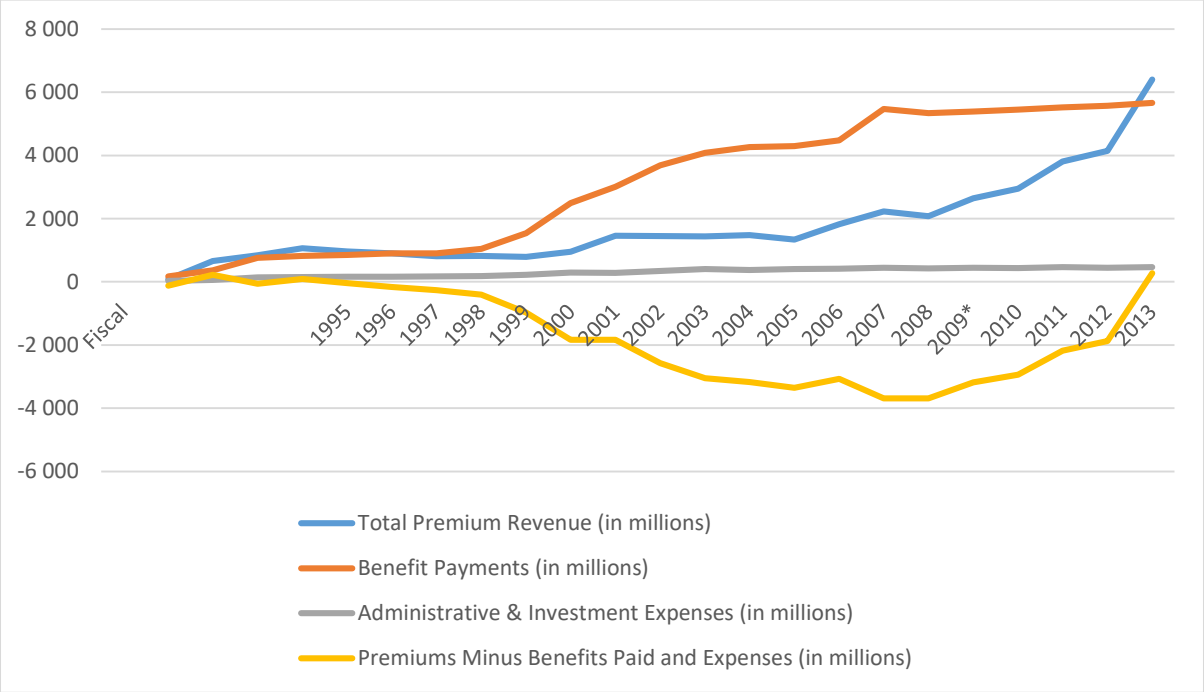

Figure 4 PBGC Premium Revenue, Benefit Payments and Expenses 1980-2016 Single-Employer Schemes[8]

"In the UK, the Pension Protection Fund's (PPF) decision to introduce a risk-based levy was based on the PBGC's experience, said PPF director of investment and finance Partha Dasgupta.". "What we did was try to understand the PBGC system, the positives and the

[8] Source: Pension Benefit Guarantee Corporation, Pension Insurance Data [Database]

negatives, and one of the things that came across clearly was that in order for the PPF to be sustainable in the long term, we needed to charge a premium that reflected the risk."[9]

This approach now was adopted by PBGC itself and seeing the improvements in its position since, seems to prove itself to be a better approach from the solvency point of view.

One of the key issues when setting premium/levy rates is how it will affect the schemes in the worst condition (severe underfunding) and at the opposite end; how the best funded schemes are burdened. The levy should not a negative impact on solvency of a scheme in distress, thus most Pension Guarantee schemes feature a cap on the levies. However, there is a point of "fairness" that one should consider: should the better funded schemes effectively subsidise the ones that are underfunded? An interesting case to consider for this discussion is the German example. Should there be a "solidarity" amongst all DB pension schemes, to help the market overall?

1.3 PSVaG – German approach

That approach is adopted by Pensions-Sicherungs-Verein Versicherungsverein auf Gegenseitigkeit (PSVaG) – the German pension protection fund, which believes that this should help to limit the number of insolvencies. On the other hand, one could argue that firstly it is unfair that the plans with sound financial positions should subsidise for underfunded schemes, secondly the argument is that the fact that a safety net is present and

[9] Professional Pensions (2006), Administration seeks PBGC levy reform, [Online], Available from: https://www.professionalpensions.com/global-pensions/news/1447018/administration-seeks-pbgc-levy-reform

sponsored by well funded plans, might encourage riskier positions to be taken by a scheme in danger.

An interesting example to consider when discussing how the PPF sets out its levies and manages its funds is the German (PSVaG) which protects German defined benefit pension funds. It was setup in 1975. They have a more retroactive approach to setting its levy. The approach is based on "solidarity" of the funds when faced with a crisis (as was the case in the aftermath of the 2008 financial crisis). Up to 2009, the highest levy rate was in 1982 as a result of AEG restructuring – 6.9‰[10] of the pension commitments. Since then the levy was between 0.3‰ in 1990 and 4.9‰ in 2005 without drastic changes in the rate between years. The average rate was 3.2‰ based on data prior to 2008.

However, the 2008 crisis increased the number of insolvencies in Germany and PSVaG faced its largest increase in expenditure in its history. To understand why, we have to consider what obligations it faced: in 2008 it paid out €506,1[10] million compensation and in 2009 the compensations grew to an unprecedented €4,068.3[10] million. Considering how the levy is calculated, it was clear that the premiums collected for that year would be dramatically higher.

The levy in 2008 was only 1.8‰[10]; however, the levy in 2009 was set to 14.2‰[10]. In 2010 it went back to pre-crisis value of 1.9‰[10]. To avoid piling up the obligations that all pension funds unavoidably face, PSVaG can split the increase into tranches and spread them

[10] PSVaG, PSV levy amounts (2016) [Online], Available from: https://www.psvag.de/fileadmin/doc/220/kennzahlen/kennzahlen_seit_1975.pdf [Accessed: 01/09/2017]

over the next 4 years, which was the case in 2009. The levy for the year is set on the basis of the value of insolvencies to be compensated by the scheme.

This is a very different approach to the risk based levy the PPF has. This approach gives rise to better management of the deficit than PPF, however it can put too much strain on the members, thus to avoid that, the increase from previous to current levy can be split up to four-year deferment, which should (and is designed to) allow the economic cycle to move on to recovery period and ease the burden on the schemes. This setup also allows the scheme to take advantage of a particularly favourable year either due to new liabilities being less than anticipated or the investment outcome exceeding expectations. This was the case in 2016 where the PSVaG levy was set to 0‰[10] only collecting the minimal levy to cover the administration costs. Overall, one can consider the German approach a special, non-standard, set up for a protection fund; as such, I will not consider it in the later discussion.

1.4 Multi Employer Schemes

Multi-employer schemes are usually valued differently by the protection schemes and are usually separated out when discussing the position of the guarantee companies. I will not discuss these in depth, only giving an overall overview, as the two approaches are very different, the historical complexities with PBGC make it a difficult topic to cover and my practical example will be based on a single employer scheme.

Let us first discuss what the PBGC's approach to multi-employer schemes is. Firstly, one has to note that the guarantee differs between single and multi-employer schemes. Multi-employer schemes have a significantly lower cap of guaranteed benefits – for 2016 it is $12,870 (for an employee with 30 years of service), whereas for single-employer schemes the

cap is $60,136 (for members retiring at 65). Another significant change from single-employer schemes is that PBGC does not receive the assets from failed multiemployer schemes. With these limitations, we can now consider how the premium is set and what the PBGC position is.

PBGC's multiemployer scheme premium is only based on the number of members on the participating multiemployer schemes and is a flat rate of $28 per member for 2017. There is no variable-rate premium as was the case in single-employer schemes. The flat rate also has no scheduled increases other than wage indexing. If we consider the rate over the years as well as the PBGC's position (assets versus liabilities), we can see that the multi-employer scheme section faces big challenges to stay solvent.

PPF values multiemployer schemes as a mixture of single employers grouped together, assessing each solvency separately and grouping them together (weighted by liability size) to assess the overall position of a multiemployer scheme. In that sense there are fewer concession than in the PBGC approach. The benefits and securities provided for multiemployer schemes do not differ from single employer schemes under PPF.

2. Practical part set up

In the practical part of the Master Final Work I will attempt an approximate valuation of the liabilities faced by a UK scheme using PBGC rules (adjusted as best as possible to the UK realities) and comparing the outcome to the liabilities obtained using Section 179 valuation calculated using assumptions that applied in 2016. The aim of this exercise is to show using a practical example how the different assumptions affect the overall valuations and provide a basis for discussion of their validity.

Let us first discuss the three main areas of difference in the actuarial valuations that will be presented and their predicted impacts. The valuation of a pension scheme's liabilities has three main areas where assumptions are set: demographic basis; economic basis and benefit structure.

2.1 Demographic assumptions - PPF

Demographic basis is mainly used to determine the future lifetime of the scheme members. This is a key assumption, as the pension benefits will have to be paid for all the future lifetime of the members. These assumptions also consider the possibility of the members having dependants that could also be entitled to receiving benefits in the future, such as spouses and children. This key assumption is set based on "mortality tables" prescribed by the relevant body (in UK PPF sets the tables to be used, in the US PBGC provides the relevant tables).

PPF demographic assumptions are based on tables published by Continuous Mortality Investigation (CMI) Bureau (wholly owned by the Institute and Faculty of Actuaries (IFoA)). The tables used for PPF valuations in 2016 were S1PMA for males and S1PFA for females. The multiplier applied was 0.9, and a set of improvements was applied, CMI_2012_M 1.5%[11] for males and CMI_2012_F 1%[11] for females.

The tables are designed using data provided by actuarial consultancies in respect of self-administered pension schemes. CMI uses the data to produce the tables for pensioners and separately for dependants (there are also separate splits for Normal Health pensioners

[11] Pension Protection Fund, Section 179 Assumption Guidance A7 (2016) [Online], Available from: http://www.pensionprotectionfund.org.uk/DocumentLibrary/Documents/Section_179_Assumptions_Guidance_VA7_May14.pdf [Accessed 01/09/2017]

and Ill-Health pensioners, as well as additional differentiation for Light or Heavy that are differentiated by pension amounts). CMI also observes the trends in improvements and aggregates that data into CMI improvement tables that are used to predict future mortality improvements, to better reflect the predicted life expectancies.

These tables are designed to reflect well the reality experienced by pension schemes. The investigation formally started in 2002, with data collection starting in 2003. The S1 tables covered the period 2000-2006. Overall 20 tables were produced, summary of methodology and assumptions used can be found in IFoA Working Paper 34[12] and the results of the investigation in Working Paper 35[12]. There are inherent limitations from using the pension schemes datasets, as the majority of data covers the ages from 35 for ill-health retirees or 60 for normal health retirees to 95. The tables produced are spanning 16 to 120, so projections were made to approximate the mortality for these ages.

2.2 Demographic assumptions - PBGC

In comparison, the US PBGC uses its own tables that it provides on its website each year. These are prescribed in collaboration with Society of Actuaries (SoA). The idea behind this is very similar to the PPF; the Society of Actuaries has the expertise necessary to derive the adequate tables that are then approved by the PBGC for use in their actuarial valuations. The obvious difference being that the dataset relates to the US population.[13]

[12] Institute and Faculty of Actuaries, CMI Working Papers 34 and 35 [Online], Available from: https://www.actuaries.org.uk/learn-and-develop/continuous-mortality-investigation/cmi-working-papers/saps/cmi-wp-34-35 [Accessed 01/09/2017]

[13] Pension Benefit Guarantee Corporation, ERISA Section 4044/4050 Mortality Tables [Online], Available from: https://www.pbgc.gov/prac/mortality-retirement-and-pv-max-guarantee/erisa-mortality-tables [Accessed 01/09/2017]

The overall trends observable are similar in both cases, the life expectancies increase over time, mainly due to advancements in medicine (in the US, also possibly by wider/easier access to healthcare). With noticeable differences in both current mortalities between sexes – males experience overall higher mortality, and with higher future improvements – males experience faster improvements, "catching up" with females.

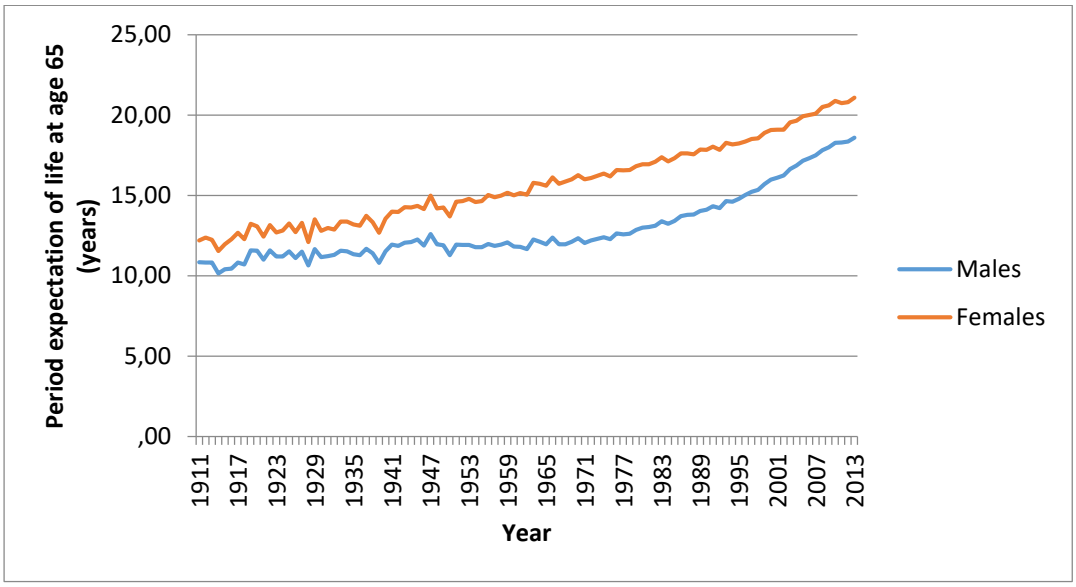

Figure 5 Period expectation of life at age 65 in UK[14]

The PBGC tables are split into more groups, but to limit the scope of this investigation I had to limit the tables used. The decision had to be made partially due to dataset limitations – for a PPF valuation, the dataset is split between retirees and deferreds only, as well as gender split, whereas PBGC would require a further split, between healthy retirees, ill-health

[14] Office for National Statistics, Statistical Bulletin (2015) [Online], Available from: https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/lifeexpectancies/bulletins/lifeexpectancyatbirthandatage65bylocalareasinenglandandwales/2015-11-04 [Accessed 01/09/2017]

retirees, Social Security members and non-social security members, the last of which is a very US specific split.

A quick comparison between mortalities used for healthy male pension scheme members reveals that the PPF tables assume higher mortality overall (note that for US, qx after age 111 is set to 0.5 and the tables finish at end age of 120 for both US and UK tables). The comparison below uses the base mortalities, PPF also prescribes an improvement table for each gender, which leads to lower mortalities in the future.

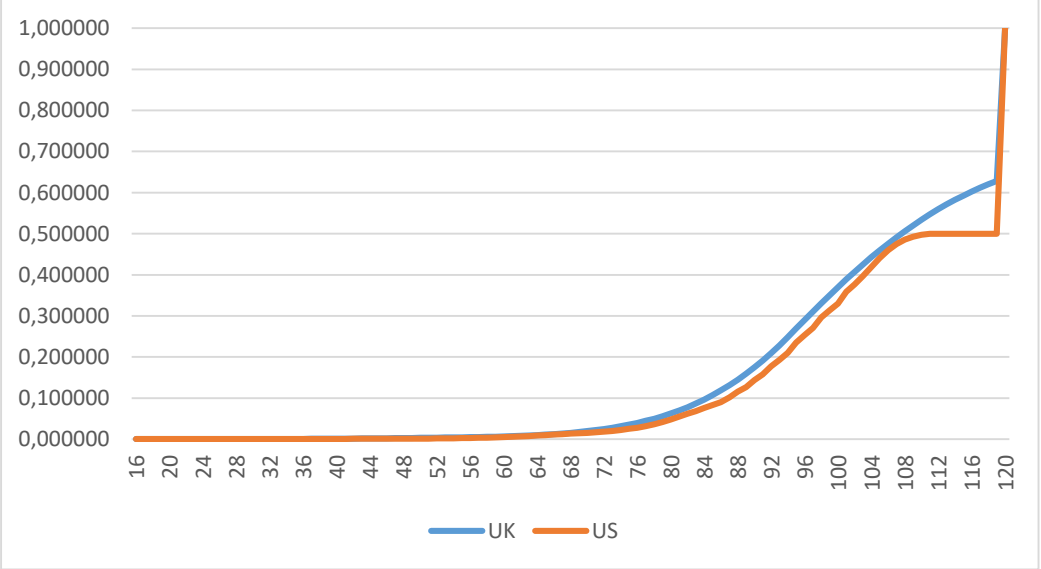

Figure 6 q_x mortality for healthy males[15]

Quick analysis of this graph would lead to a conclusion that US assumptions would lead to longer expected lives for their members, however US has no allowance for future mortality improvements, whereas UK assumes the mortality rates will decrease in the future. This would have the expected impact of increasing the expected future liabilities in the UK

[15] IFoA, S1 series tables (2008) [Online], Available from: https://www.actuaries.org.uk/learn-and-develop/continuous-mortality-investigation/cmi-mortality-and-morbidity-tables/s1-series [Accessed 01/09/2017]

(unless there are high death lump sum payments in place), as the pension is expected to be paid out for a longer period of time.

2.3 Economic assumptions

Economic assumptions are another key aspect of setting up the actuarial valuation, in the PPF valuation the rules are prescribed as follows:

Discount rate for a PPF valuation is:

1.Discount rate for in deferment for pre-2009 accrual:

$$Adjusted\ net\ index-linked\ gilt\ yield\ =\ Yield\ A\ -\ 0.3\%^{16},$$

where Yield A is determined as 50% of the sum of the FTSE Actuaries' Government Securities Index-Linked annualised Real Yields over 15 years assuming either 5% or 0% inflation;

2.Discount rate for in deferment for post 2009 accrual:

$$Adjusted\ yield\ =\ higher\ of\ (Yield\ A\ -0.3\%)\ and\ (Yield\ B\ -2.2\%)^{16},$$

where Yield B is determined as the annualised FTSE Actuaries' Government 20-year Fixed Interest Index.

3.Compensation not increasing in deferment:

$$Adjusted\ gilt\ yield\ =\ Yield\ B\ -\ 0.1\%^{16},$$

[16] Pension Protection Fund, Section 179 Assumptions Guidance A7 [Online], Available from: http://www.pensionprotectionfund.org.uk/DocumentLibrary/Documents/Section_179_Assumptions_Guidance_VA7_May14.pdf [Accessed 01/08/2017]

PBGC has a simpler rule for the discount rate used for the valuation: according to ERISA 4044 rules, the rate is 2.44% for the first 20 years and 2.74% afterwards[17]. To have a quick comparison, the single discount rate we will consider further in the example scheme to be study for PPF is 1.92%, meaning that PBGC allows for a significantly higher discount rate.

The expected impact of having a higher discount rate is that the present value of the future liabilities faced by the PPF/PBGC will be lower, as the simple relation between discount rate and Present Value of money is: the higher the discount rate, the lower the present value of money.

4.Compensation with no increases in payment:

$$Adjusted\ yield\ =\ Yield\ C\ -0.1\%^{16},$$

where Yield C is determined as the annualised yield on the FTSE Actuaries' Government 15-year Fixed Interest Index.

5. Compensation increasing in payment:

$$higher\ of\ (Yield\ D\ +0.1\%)\ and\ (Yield\ C\ -\ 2.2\%)^{16},$$

where Yield D is determined as 50% of the sum of the FTSE Actuaries' Government Securities Index-Linked annualised Real Yields over five years, with either 5% or 0% inflation assumption.

One can observe here, that the PPF requires a split of the pension of each member, based on the period during which it was accrued. The splits required are as follows:

[17] Pension Benefit Guarantee Corporation, ERISA 4044 Annuities [Online], Available from: https://www.pbgc.gov/prac/interest/ida [Accessed 01/08/2017]

1. Pre 6 April 1997 pension – receives no increases of the pension amounts either in deferment or in payment[16]
2. Post 5 April 1997 to pre 6 April 2009 pension – receives maximum of Retail Price Index (RPI) capped at 5% in deferment increases and in payment it will be increased by Consumer Price Index (CPI) capped at 2.5%[16]
3. Post 5 April 2009 pension – receives maximum of RPI capped at 2.5% in deferment increases and in payment it will be increased by CPI capped at 2.5%[16]

2.4 Benefit assumptions

Finally, we have the third key part of the actuarial assumptions for the valuation that is the expected increases in compensation benefits secured under PPF and PBGC. As shown already, PPF secures different benefits based on when the pension was accrued, as well as differentiating between in deferment and in payment increases. From 31 March 2011, CPI replaced RPI as the key measure of inflation (Retail Price Index is typically higher in the UK, thus the move to Consumer Price Index should decrease the guaranteed increases). This further increases the complication of applying the correct increases to the correct tranches of the pensions for each member valued.

In the US, PBGC does not guarantee any inflationary increases of pension once it takes over the Pension Scheme's liabilities. This has a very significant impact both on the liabilities it faces and on the pensioners it protects. Guaranteeing no counter-inflationary increases means that the pension amount will lose its purchasing powers over the years, which can render the pension accrued worth significantly less than expected by the pension scheme member.

To quickly illustrate why having no counter-inflationary increases is so significant, let us quickly consider a very simple example of 1000 investment over 20 years of inflation and its purchasing power over the years, 20 years being expected length of a typical retiree's life at 65 with the current 2% inflation target

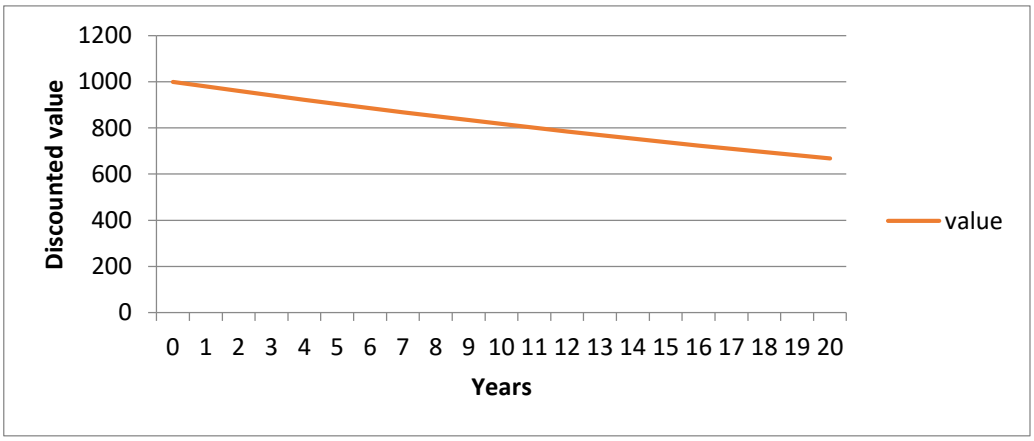

Figure 7 Value of £1000 discounted using 2% inflation (Illustration)

3. Practical assumptions and results

Let us now discuss the practical results that I obtained using the example of a fictional UK DB pension scheme and 2016 PPF valuation. The example scheme is made up to reflect common features of a mature DB pension scheme in the UK. The PPF results are computed using all the prescribed assumptions given by the PPF for a 2016 valuation. All calculations and PBGC results are my own approximations of my understanding of the PBGC ruleset and are made for illustrative purposes only. This is a single employer scheme with no Active members.

I will be considering a 2016 pension scheme dataset. Where a change to of one of the three key assumption areas (Demographic, economic or Benefits) is not specified, it should

be assumed that the PPF assumptions were used, as they will be the baseline for all comparisons.

Limitations: this comparison has many limitations but I believe that the overall conclusions were not significantly affected by them and the discussion of the final results is still valid to showcase the measures taken by the PPF to design their valuations in the best way possible. US pension cap not being converted is one of them, the maximum benefit amount could have been capped at the US limit, however, the dataset is of UK population, thus one can argue that the UK cap is more relevant.

Brief description of the scheme population, there are four possible states for a scheme member:

- Active – Still a working member, whose future pension obligations can still grow, as his/her final salary is not known yet.
- Deferred pensioner – member who is not working at the company anymore for whatever reason, but is not a pensioner yet, e.g.. changed employer. Their liability is easier to asses, as their final salaries are already known, reducing the number of variables.
- Retirees – pensioners who are already getting their pensions from the scheme.
- Dependants – either spouses of deceased scheme members who obtain (usually a part of, eg. 50%) member's pension following the member's death or children who obtain a payment until they reach a certain age (usually till 18 or 23 if in full time education after high school).

In my scheme example, there are no active members present. This simplifies the calculations and should be a reasonably good example, as most DB pension schemes are closing to accrual and to new members in the UK. The average ages presented here are simple averages, simply to show the average population age by gender. An interesting point to notice about this population is that because most of the Deferred and Retired members are males, most of the Dependants are female. This is a typical feature of many mature pension schemes; a possible explanation of the male majority in the deferred and retired statuses is the fact that female employment rates in the past were noticeably lower than male employment rates. For example, in the first two months of 1971 male employment rate in the UK was 91.7%, whereas for females it was 52.7%[18]. There are no children in the dependant population.

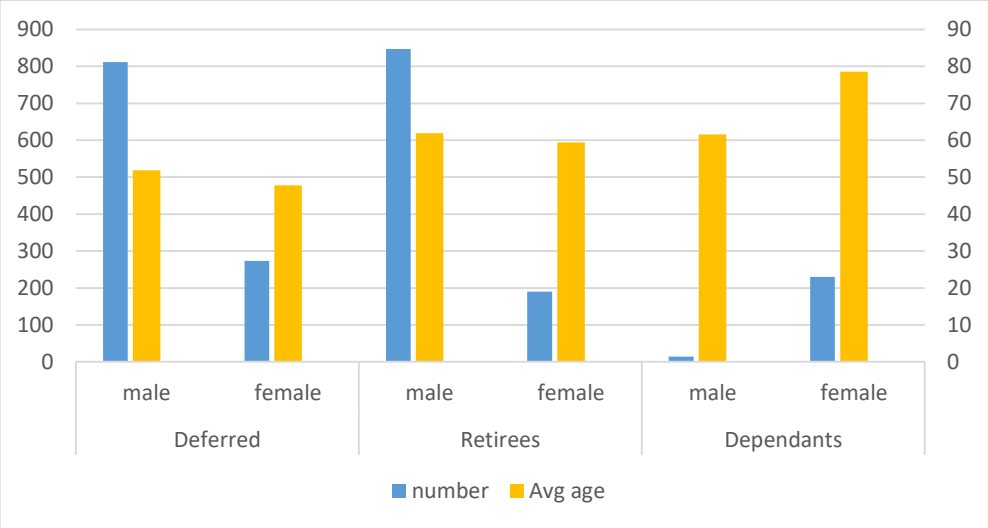

Figure 8 Scheme population[19]

Scheme assets are given as £356,448,000.00 for the 2016 valuation.

[18] Office for National Statistics, Unemployment [Database], Available from: https://www.ons.gov.uk/employmentandlabourmarket/peoplenotinwork/unemployment [Accessed 01/10/2017]

[19] See Appendix I

Let us use the PPF assumptions as benchmark. The total liabilities are £354,676,405.00, the funding ratio is 100.5%, and the discounted mean term is 20.5 years. This means that the scheme is well covered on PPF basis, if it had to go into insolvency, it would be able to cover the PPF liabilities with the current assets. This also means that in the case of insolvency, the scheme might be able to approach an insurance company directly and try to transfer its liabilities to them, as the assets they have are expected to be able to cover them.

The point to note before we consider my results and discuss their implications is that for the PBGC runs I used the normal scheme solvency liability as underlying conditions modifying step by step the PBGC assumptions to show their impact. This approach was used due to technical limitations (I was unable to make a PBGC valuation with some PPF and some PBGC assumptions, as the setup used expects either all PPF assumptions or all non-PPF assumptions). Bearing that in mind, the most useful comparison will be the final one (Run 7) where all PBGC assumptions are in place and comparing it with PPF, but in order to try to highlight key aspects of each assumption set separately I will briefly discuss them on their own.

3.1 Demographic assumptions results

Let us first consider the impact of PBGC demographic assumptions. As mentioned before, the main difference is the change of mortality tables used. I used PBGC normal deferred tables for all members. This is a certain approximation, as otherwise PBGC prescribes tables for different statuses however, as there were no future improvements allowed for in the tables, I chose the table that matched the current mortalities as closely as possible.

Let us now compare the calculated liabilities and mean terms, as those will be the most affected by the change of demographic assumptions.

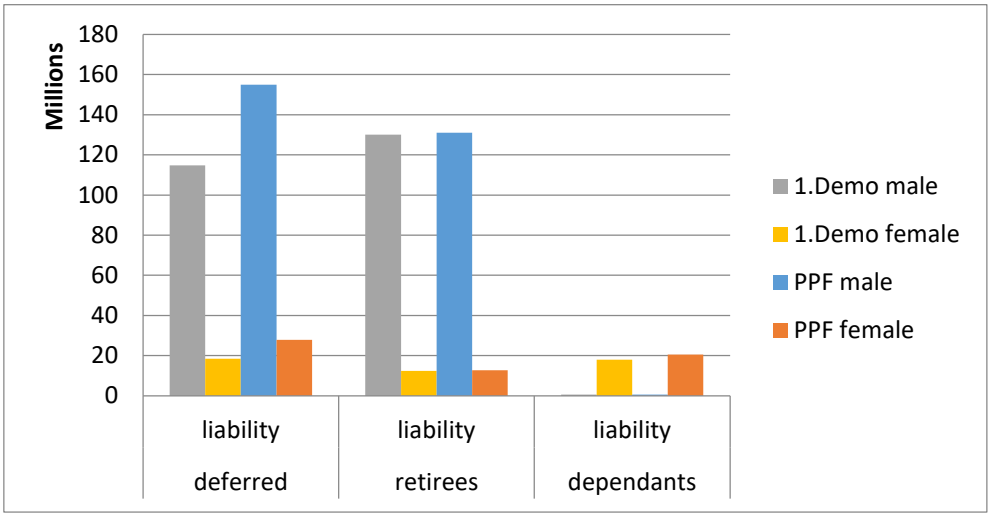

Figure 9 Run 1. Demographic assumptions[20]

On the graph above you can find a comparison of the liabilities split by membership type (Deferred, Retired or Dependant). The interesting point to consider is that retirees' liabilities were the least affected group, whereas deferred and dependants decreased significantly. To explain that phenomenon let us take a closer look at qx mortality rates set by PPF and PBGC:

[20] See Appendix I

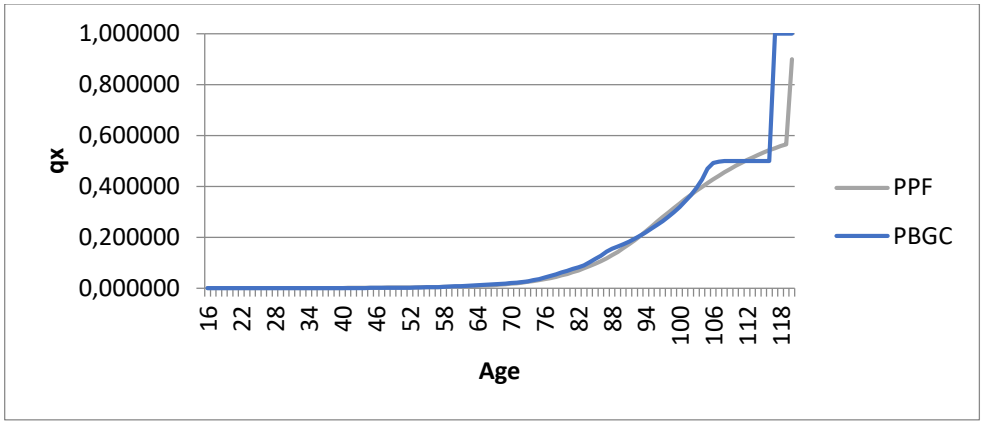

Figure 10 q_x mortality rates for males[21]

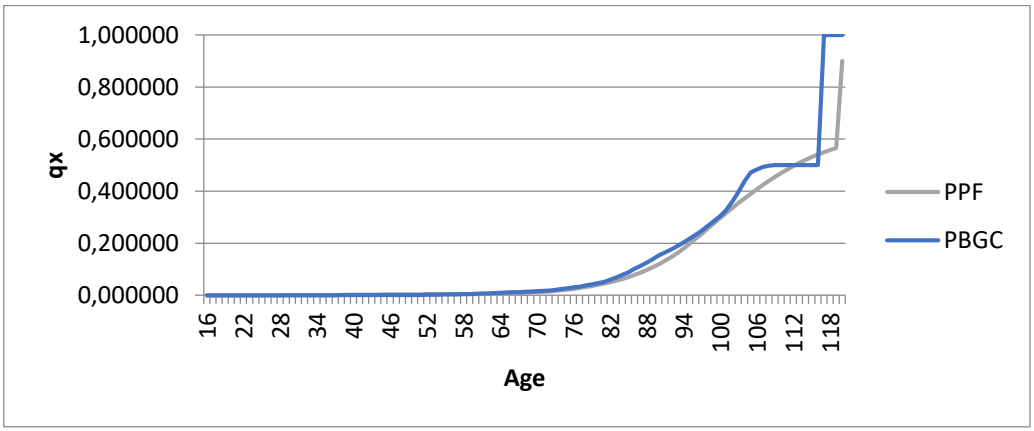

Figure 11 q_x mortality rates for females[22]

The two points two note here are the mortalities between 65 and 85, where most of the retirees will fall in and mortality are pretty evenly matched. Because the discounted mean term for retirees at this point is on average 11 to 12 years, the time horizon is relatively short (compared to deferred members), thus the very similar results for PPF and PBGC. For dependants, the average age is 78.6 for females and 61.6 for males with discounted mean terms of 9.3 and 9.6 respectively. Again, mortalities are reasonably close to each other, with

[21] IFoA, S1 series tables (2008) [Online], Available from: https://www.actuaries.org.uk/learn-and-develop/continuous-mortality-investigation/cmi-mortality-and-morbidity-tables/s1-series [Accessed 01/09/2017]

[22] IFoA, S1 series tables (2008) [Online], Available from: https://www.actuaries.org.uk/learn-and-develop/continuous-mortality-investigation/cmi-mortality-and-morbidity-tables/s1-series [Accessed 01/09/2017]

the noticeable differences starting from age 81, thus the results are again reasonably closely matched, but the difference is more noticeable here.

The most interesting case is the deferred group. Looking at the qx mortality rates does not provide the straightforward answer as to why the difference is so pronounced. Overall, the two graphs are reasonably similar, with big difference for ages 80-95 and then 101+ where PBGC makes general assumptions regarding member mortality.

However, something that is not shown on these graphs are the future mortality improvements that are implemented in the PPF assumptions, but there is no equivalent of them in PBGC. The future mortality improvements are used by PPF to make the future life expectancy estimates more accurate, as there is an assumption that life expectancies will in general improve over time with advancements in medicine, nutrition etc. PPF uses CMI 2012 improvements set for males and females. The effect of this is that future life expectancies increase, which increases the period of time for deferred members to be retired and receive their pensions, thus increasing the liabilities.

The fact that PBGC does not use this kind of improvements decreases the deferred liabilities projection significantly.

3.2 Economic assumptions results

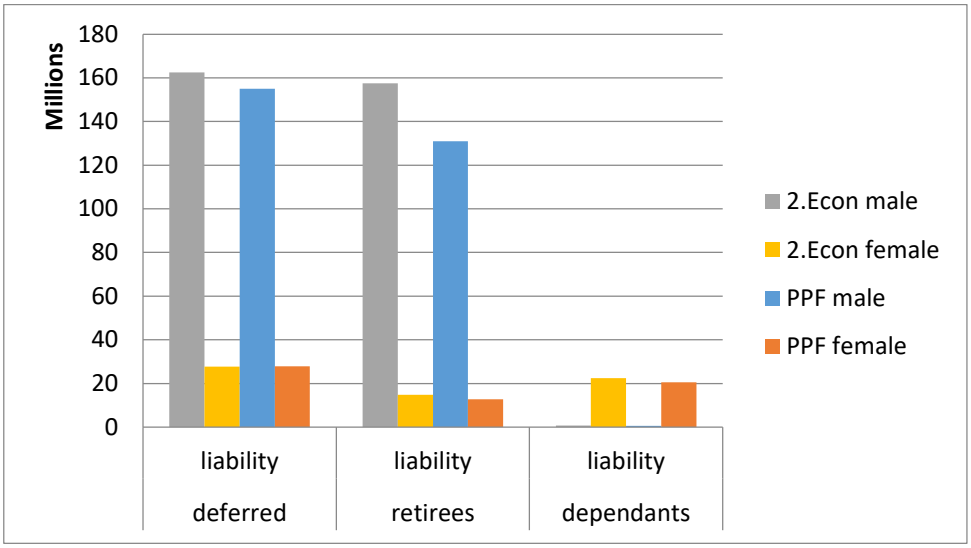

Figure 12 Run 2. Economic assumptions [23]

An interesting comparison is to take a closer look at the economic assumptions impact on the liabilities. Consider the discount rate prescribed by the PPF for their valuation is set as a flat 1.92%. The US PBGC discount rate is set as 2.77% for the first 20 years and 2.86% afterwards. This comparison is showing that liabilities increased with the higher discount rate, which is counter-intuitive, but the reason for that is that the benefit increases applied in this PBGC run are the standard increases applied by the scheme, which are more generous than the PPF ones, thus making this comparison of limited use, so I will discuss the impact of Economic assumptions later.

[23] See Appendix II

3.3 Benefits assumptions results

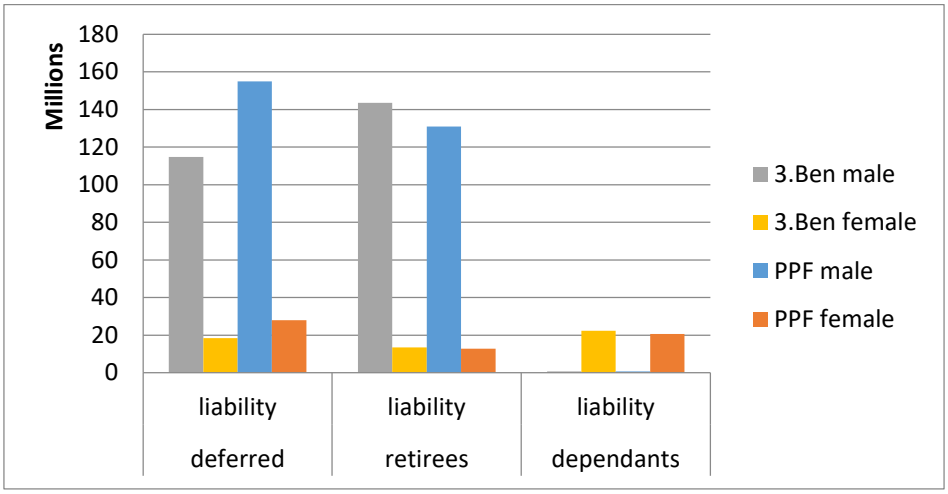

Figure 13 Run 3. Benefits assumptions[24]

Finally, the third sets of assumptions to consider are the benefits assumptions. As in the case of Run 2 the comparison is limited due to the fact that other assumptions also differ, giving a skewed result. Because of that let me just comment in general on the results without discussing the numbers in depth, leaving that part to the final (Run 7) comparison.

Looking at the liabilities for deferred members, we can note a very significant decrease in liability amounts. That is due to the fact that once a scheme enters PBGC administration, no increases are allowed for at all, all scheme increases are ceased immediately and no alternatives are applied. Because of that, the value of the accrued benefits will lose its purchasing power over the years due to inflation. Average age of a male deferred member is 51.9 and female is 47.8. Assuming retirement age of 60, their pensions will be exposed to inflation for 8 and 12 years respectively. Assuming inflation being flat 2% (usual inflationary target for developed countries), the value at 60 of £1 today will be £0.85 for males and £0.79

[24] See Appendix III

for females. (the formula is $v^n = \frac{1}{(1+i)^n}$, where v is the discount rate, I is the inflation rate and n is the number of years).

3.4 Demographic & Benefits assumptions results

Figure 14 Run 4. Demographic & Benefits assumptions[25]

Again, let us quickly consider the results for combined Demographic and Benefits assumptions. As shown above with the Benefits assumptions, the main impact is on the Deferred group, with the difference now being: PPF – £154.9m; PBGC – £103.4m. This represents a 33% reduction in the projected liabilities. This is the most detrimental combination for this group, as the demographic assumptions had the most significant effect on them (lack of future improvements in mortality) and the lack of pension increases will also affect them the most (longest time period in the scheme).

[25] See Appendix IV

Retirees are not affected as significantly as deferreds, but in this comparison we see the true effect of the demographic and benefit assumptions, that were not truly shown before, due to the setup for PBGC.

3.5 Demographic & Economic assumptions results

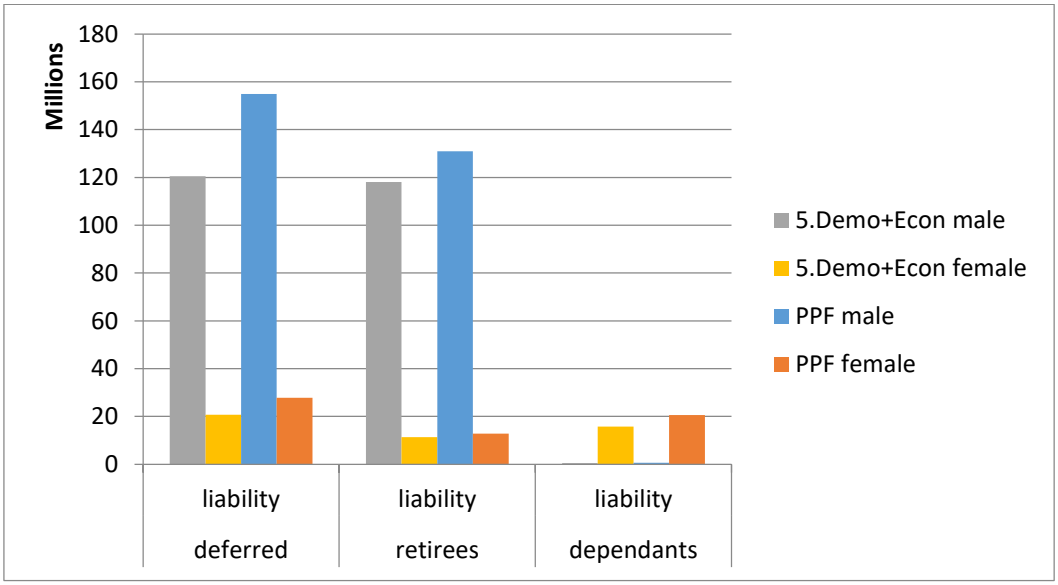

Figure 15 Run 5. Demographic & Economic assumptions[26]

Similarly to Run 4 results, the most significantly affected group is the deferred member group, with retirees also showing a significant decrease. The most interesting case to highlight here is the dependants.

In case 3.4 they showed a relatively small decrease in liabilities, whereas the combination of Demographic and Economic assumptions showed the biggest impact for them so far. This can be potentially attributed to the higher discount rate for PBGC as well as higher

[26] See Appendix V

mortality at later ages as well (and possibly the number of approximations made by PBGC there).

This case can be considered to be of most use; as the assumptions used are not as tough on the scheme members as full PBGC assumptions (see part 3.7). In this case the members will still receive increases in deferment and in payment on their pension amounts, whilst being subject to US economic and demographic assumptions. Clearly, even comparing to either case 3.4 or 3.5, the reduction in liabilities is not as dramatic. One could argue, that if PBGC approach was to be implemented in the UK, this case would have been most likely to be the one chosen. Speculating on the reason why PBGC implements the harsh benefits assumptions, one could argue that possibly the historical deficit causes PBGC to require dramatic liabilities reduction in order to sustain its obligations. This is an issue that was not faced by the PPF upon its creation in 2004.

3.6 Economics & Benefits assumptions results

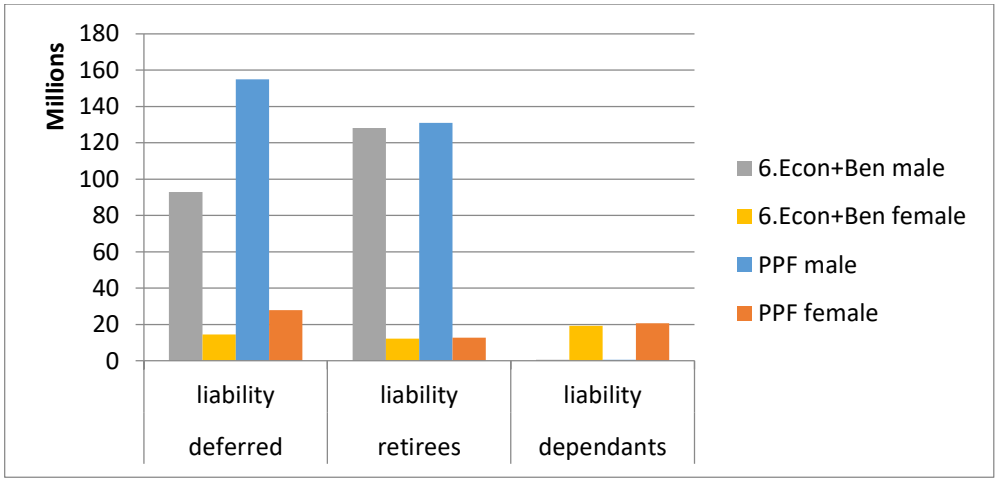

Figure 16 Run 6. Economic & Benefits assumptions[27]

[27] See Appendix VI

The combination of economic and benefits assumption is again impacting the deferred members the most. Again over 33% reduction in the projected liability has to be attributed to the fact that deferred members will be exposed to the PBGC assumptions the longest (lack of pension increases as well as higher discount rate).

3.7 PBGC assumptions results

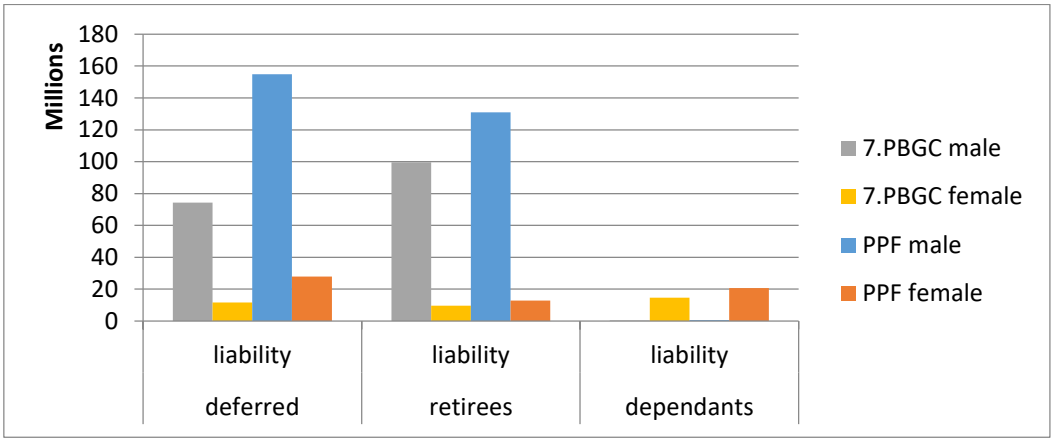

Figure 17 Run 7. PBGC assumptions[28]

Finally, we can see the overall impact of all the PBGC assumptions on the actuarial valuation. As expected, based on the previous examples, the most significantly affected group are the deferred members. The combination of a lack of increases of pensions, lack of mortality improvements and the higher discount rate all come together to make a huge difference on the liabilities valuation. Again, the main reason deferred members are most significantly affected can be simply attributed to the fact that these members will be exposed to the unfavourable (from their perspective) changes the longest.

[28] See Appendix VII and Appendix VIII

Table I PBGC liabilities compared to PPF[29]

	deferred			retirees			dependants		
	liability (£m)		disc mean term	liability (£m)		disc mean term	liability (£m)		disc mean term
7.PBGC male	£	74.3	19.7	£	99.6	10.1	£	0.5	8.2
7.PBGC female	£	11.6	23.3	£	9.6	9.5	£	14.7	7.9
total	£	85.9		£	109.2		£	15.2	
PPF male	£	154.9	27.3	£	130.9	12.9	£	0.6	11.1
PPF female	£	27.8	31.0	£	12.8	12.2	£	20.6	10.3
total	£	182.8		£	143.7		£	21.2	

The above table shows the two key metrics that I wanted to highlight when discussing the impact of PBGC assumptions. The obvious comparison is the liability, the end result of an actuarial valuation and arguably the most important metric to show. However, to show the impact of demographic assumptions more directly I wanted to show the discounted mean term metric as well. The discounted mean term shows average term of the liabilities, weighted by value.

$Duration = \sum_{i=1}^{n} t_i * \frac{PV_i}{V}$, also know as Macaulay duration, where i is the payment number; PV_i is the present value of the ith payment; t_i is the time until the ith payment; V is the present value of future payments.

In the table below I am showing the difference between corresponding values, i.e. PPF-PBGC for all values and the % reduction of both liabilities and discounted mean term:

[29] See Appendix VII and Appendix VIII

Table II PPF-PBGC change comparison[30]

	deferred		retirees		dependants	
	liability (£m)	disc mean term	liability (£m)	disc mean term	liability (£m)	disc mean term
Male difference	£ 80.6	7.6	£ 31.3	2.8	£ 0.2	2.9
Female difference	£ 16.3	7.7	£ 3.2	2.7	£ 5.9	2.4
Total difference	£ 96.9		£ 34.5		£ 6.1	
reduction % for male	52%	28%	24%	22%	29%	26%
reduction % for female	58%	25%	25%	22%	29%	23%
reduction % for total	53%		24%		29%	

An interesting point to note is that the discounted mean term reduction percentage is similar for all 3 statutes – between 22% and 28%. The main assumptions impacting the change are the economic assumptions and the demographic assumptions.

The reduction in liabilities is by far the most prominent in the deferred status. As argued before, the main impact on deferred members that is not as significant for other statuses is the change in benefits assumptions. Lack of pension increases in deferment as well as in payment means that their deferred pensions are worth significantly less today, simply by applying a growing discount factor to a fixed amount over the years.

4. Conclusion and final research

The results achieved may indicate that on establishing the PPF, which was set up after the PBGC and in light of the PBGC's relatively weak financial position today, the UK government defined the valuation assumptions more conservatively in order to increase the

[30] See Appendix VII and Appendix VIII

PPF premiums, with the aim being to avoid similar stressed positions as those experienced today by US PBGC.

The fact that the PPF S179 valuation values the example scheme as a significantly higher liability can imply that it expects to take on much higher obligations in the future, which can be dangerous in the long term. However, one must remember, that the one assumption that had the most significant impact on the valuation was the Benefits assumption. Lack of any increases in deferment or in payment of the pension amount will lead to significant deterioration of the real value of the pension that PBGC guarantees. One can argue how that might impact the socio-economic situation of some of the members most affected by it.

The counter-argument to the benefit assumptions set by PBGC is the current financial state that they find themselves in. By that measure, it can be seen as a reaction to the situation and an attempt to simply guarantee future existence of the PBGC as a whole that will unfortunately have a very negative effect for some.

Another assumption whose validity can be questioned is the demographic assumption. Obviously PBGC operates in the US and PPF in the UK, thus the members live in different countries and thus can experience different mortalities. However, I would question the lack of future improvements implemented in the PBGC assumptions. Both the UK and the US are highly developed first world countries and are generally expected to experience life expectancy improvements in the future. Lack of a provision for that in the PBGC set makes the results questionable, as the pensions might be paid for significantly longer in the future than under current predictions, if no allowance for improvements is made.

All in all, I would argue that my comparison shows that the PPF model, even with the more “unfavourable” assumptions (such as future life expectancy improvements and benefits increase assumptions) is probably more realistic and overall more sustainable than what PBGC currently does. Making a more realistic prediction of the liabilities, even if it would imply higher risk and levies today is clearly a better way to prepare the PPF for what it will face in the future. This can allow the schemes to have more trust in the PPF and its ability to deliver its obligations in the future.

As discussed in the assumptions section, my investigation was limited in some ways. When preparing for my master final work I tried to find similar investigations, but I couldn’t find anything that had similar scope to mine. I find that further investigations into this area could be useful, or at least quite interesting from both academic and regulatory perspective.

I only concentrated on single employer schemes, mainly to limit myself to a topic that could be covered in this work, however, the multiemployer schemes are the main source of deficit in the PBGC and thus further research into them could be quite valuable.

Another idea would be to replicate my investigation on a US pension scheme. I applied PBGC rules to a UK scheme that is part of the PPF, the reverse could be possibly done, where a US scheme is valued under section 179 rules to find the differences in approaches there.

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8. Appendix

Note: Please note that the "Assumptions summary" labels do not change between the runs attached, this does not mean that the assumptions did not change. The labels summary should have been updated manually which I failed to do, thus the repetitions, but the results are correct and I would refer back to the main text with the description of the assumptions used for each run.

Appendix I:

euVal Liabilities Release 2.51.17.0 Run at: 28/07/2017 16:17:23 (2.51.17.0)	**Appendix I** Maciej Skwierczynski Training Client 2016 data job Run 1 - 1.Demo [v1]
Valuation balance sheet	
Effective date:	31/03/2016
Valuation run description:	
Currency/units:	£s
Assumptions summary:	
Economic basis	TP E
Demographic basis	PBGC
Funding method:	Projected unit
Past service liabilities:	
Actives	0
Deferred pensioners	133,137,095
Retirees	142,501,624
Dependants	18,603,145
Total past service liability excluding expenses	294,241,864
Total past service liability including expenses	**294,241,864**
Assets:	
Total value of assets	356,448,000
Balance sheet:	
Surplus/(Deficit)	62,206,136
Funding level	121.1%
Statistics:	
Discounted mean term	17.4

Appendix II:

euVal Liabilities Release 2.51.17.0 Run at: 28/07/2017 16:18:43 (2.51.17.0)	Appendix II Maciej Skwierczynski Training Client c 2016 data job Run 1 - 2.Economic [v1]
Valuation balance sheet	
Effective date:	31/03/2016
Valuation run description:	
Currency/units:	£s
Assumptions summary:	
Economic basis	TP E
Demographic basis	PBGC
Funding method:	Projected unit
Past service liabilities:	
Actives	0
Deferred pensioners	190,288,388
Retirees	172,337,995
Dependants	23,094,902
Total past service liability excluding expenses	385,721,285
Total past service liability including expenses	**385,721,285**
Assets:	
Total value of assets	356,448,000
Balance sheet:	
Surplus/(Deficit)	(29,273,285)
Funding level	92.4%
Statistics:	
Discounted mean term	20.3

Appendix III:

euVal Liabilities Release 2.51.17.0 Run at: 28/07/2017 16:19:36 (2.51.17.0)	Appendix III Maciej Skwierczynski Training Client c 2016 data job Run 1 - 3.Benefit [v1]
Valuation balance sheet	
Effective date:	31/03/2016
Valuation run description:	
Currency/units:	£s
Assumptions summary:	
Economic basis	TP E
Demographic basis	PBGC
Funding method:	Projected unit
Past service liabilities:	
Actives	0
Deferred pensioners	133,137,095
Retirees	156,935,641
Dependants	23,094,902
Total past service liability excluding expenses	313,167,639
Total past service liability including expenses	**313,167,639**
Assets:	
Total value of assets	356,448,000
Balance sheet:	
Surplus/(Deficit)	43,280,361
Funding level	113.8%
Statistics:	
Discounted mean term	17.9

Appendix IV:

euVal Liabilities Release 2.51.17.0 **Run at: 28/07/2017 16:20:26 (2.51.17.0)**	**Maciej Skwierczynski Training Client** **c 2016 data job** **Run 1 - 4.Demo+Ben [v1]**
Valuation balance sheet	
Effective date:	31/03/2016
Valuation run description:	
Currency/units:	£s
Assumptions summary:	
Economic basis	TP E
Demographic basis	PBGC
Funding method:	Projected unit
Past service liabilities:	
Actives	0
Deferred pensioners	103,391,188
Retirees	119,372,127
Dependants	19,774,637
Total past service liability excluding expenses	242,537,952
Total past service liability including expenses	**242,537,952**
Assets:	
Total value of assets	356,448,000
Balance sheet:	
Surplus/(Deficit)	113,910,048
Funding level	147.0%
Statistics:	
Discounted mean term	15.1

Appendix V:

euVal Liabilities Release 2.51.17.0 **Run at: 28/07/2017 16:21:00 (2.51.17.0)**	Appendix V **Maciej Skwierczynski Training Client** **c 2016 data job** **Run 1 - 5.Demo+Econ [v1]**
Valuation balance sheet	
Effective date:	31/03/2016
Valuation run description:	
Currency/units:	£s
Assumptions summary:	
Economic basis	TP E
Demographic basis	PBGC
Funding method:	Projected unit
Past service liabilities:	
Actives	0
Deferred pensioners	141,224,394
Retirees	129,406,837
Dependants	16,238,122
Total past service liability excluding expenses	286,869,354
Total past service liability including expenses	**286,869,354**
Assets:	
Total value of assets	356,448,000
Balance sheet:	
Surplus/(Deficit)	69,578,646
Funding level	124.3%
Statistics:	
Discounted mean term	16.9

Appendix VI:

euVal Liabilities Release 2.51.17.0 Run at: 28/07/2017 16:21:29 (2.51.17.0)	**Appendix VI** **Maciej Skwierczynski Training Client** **c 2016 data job** **Run 1 - 6.Econ+Ben [v1]**
Valuation balance sheet	
Effective date:	31/03/2016
Valuation run description:	
Currency/units:	£s
Assumptions summary:	
Economic basis	TP E
Demographic basis	PBGC
Funding method:	Projected unit
Past service liabilities:	
Actives	0
Deferred pensioners	107,318,013
Retirees	140,262,236
Dependants	19,774,637
Total past service liability excluding expenses	267,354,886
Total past service liability including expenses	**267,354,886**
Assets:	
Total value of assets	356,448,000
Balance sheet:	
Surplus/(Deficit)	89,093,114
Funding level	133.3%
Statistics:	
Discounted mean term	16.5

Appendix VII:

euVal Liabilities Release 2.51.17.0 Run at: 28/07/2017 16:22:16 (2.51.17.0)	**Appendix VII** **Maciej Skwierczynski Training Client** **2016 data job** **Run 1 - 7.Econ+Ben+Demo [v1]**
Valuation balance sheet	
Effective date:	31/03/2016
Valuation run description:	
Currency/units:	£s
Assumptions summary:	
Economic basis	TP E
Demographic basis	PBGC
Funding method:	Projected unit
Past service liabilities:	
Actives	0
Deferred pensioners	85,930,026
Retirees	109,215,168
Dependants	15,163,069
Total past service liability excluding expenses	210,308,263
Total past service liability including expenses	**210,308,263**
Assets:	
Total value of assets	356,448,000
Balance sheet:	
Surplus/(Deficit)	146,139,737
Funding level	169.5%
Statistics:	
Discounted mean term	14.0

Appendix VIII:

euVal Liabilities Release 2.51.17.0 **Run at: 22/07/2017 17:14:06 (2.51.17.0)**	**Maciej Skwierczynski Training Client** **2016 data job** **Run 1 - PPF basis 2016 [v1]**
Valuation balance sheet	
Effective date:	31/03/2016
Valuation run description:	
Currency/units:	£s
Assumptions summary:	
Economic basis	PPF basis 2016
Demographic basis	PPF basis 2016
Funding method:	Projected unit
Past service liabilities:	
Actives	0
Deferred pensioners	182,790,949
Retirees	143,721,118
Dependants	21,245,364
Additional liabilities	0
Total past service liability excluding expenses	347,757,431
Expenses	6,918,974
Total past service liability including expenses	**354,676,405**
Assets:	
Total value of assets	0
Balance sheet:	
Surplus/(Deficit)	(354,676,405)
Funding level	0.0%
Statistics:	
Discounted mean term	20.5