LISBON
SCHOOL OF
ECONOMICS &
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UNIVERSIDADE DE LISBOA

MASTER

ACTUARIAL SCIENCE

MASTER´S FINAL WORK

INTERNSHIP REPORT

EQUALIZATION OF GUARANTEED MINIMUM PENSIONS IN THE UNITED KINGDOM

ARTA ZAJMI

OCTOBER – 2019

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SUPERVISORS

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ONOFRE ALVES SIMÕES

OCTOBER – 2019

This work is wholeheartedly dedicated to my Dad, who has been my source of inspiration and gave me strength when I thought of giving up, who continually provided me with moral, emotional and financial support.

Thank you for never ceasing to believe in me.

Forever grateful,

Arta

Abstract

Before 1978 in the United Kingdom, government paid all state pensions. However, in April 1978 private pension schemes were given the option to pay their members a part of the state pension as long as they followed the same rules. That part of the pension is called the Guaranteed Minimum Pension (GMP).

GMP is calculated considering several factors, such as the member's age, sex and working lifetime. GMP payment age is different for male and female members, as well as the accrual rate, which is dependent on the working lifetime of the member. These differences led to inequalities in the GMP pension between male and female members that had the same service period.

In 2018, three female members, due to these inequalities, sued the trustees of the Lloyds Bank pension scheme. As an outcome of this judgment, all pension schemes in the UK were obliged to equalise GMP for all their members. In spite of the ruling, a clear way on how to proceed with the equalisation was not given, though some methods were proposed. As of now, schemes have the authority to choose the method they find most convenient.

As this is a very pressing problem, this paper is entirely devoted to it. After setting the framework, we present how GMP is calculated, analyse the different factors that cause inequalities and show how the equalisation is achieved through the proposed methods. A number of examples and illustrations are provided.

KEYWORDS: Pension Schemes, Guaranteed Minimum Pension, UK

Resumo

Antes de 1978, no Reino Unido, era ao Estado que competia assegurar o pagamento das pensões. No entanto, em abril de 1978, foi dada a possibilidade de os planos de previdência privados assumirem uma parte do sistema, desde que seguissem as mesmas regras. Foi assim que surgiu a chamada pensão mínima garantida (PMG).

A PMG é calculada considerando vários fatores, como idade, sexo e vida útil do membro. A idade de pagamento do benefício é diferente para membros masculinos e femininos, bem como a sua taxa de formação, que depende da vida útil do membro. Essas diferenças levaram a desigualdades nos montantes atribuídos a homens e mulheres com o mesmo período de serviço. Em 2018, três membros do sexo feminino, devido a essas desigualdades, processaram os administradores do esquema de pensões do Lloyds Bank. Como resultado deste processo, todos os regimes de pensões no Reino Unido ficaram obrigados a eliminar as diferenças injustificadas entre as PMG dos seus membros. O problema é que, a par da decisão, *não* foi indicada uma forma clara de como proceder para atingir a desejada equalização. Ainda que alguns métodos tenham sido propostos, a verdade é que os esquemas têm autonomia para escolher o método que acharem mais conveniente.

Como se trata de um tema muito atual e que exige tratamento imediato, este trabalho é--lhe inteiramente dedicado. Depois de se fazer o necessário enquadramento do problema, apresentam-se os métodos de cálculo da PMG, analisam-se os diferentes fatores que causam desigualdades e mostra-se como a equalização é alcançada através dos métodos propostos. São fornecidos vários exemplos e ilustrações.

PALAVRAS-CHAVE: Regime de pensões, pensão mínima garantida, Reino Unido

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Abbreviations and Acronyms

BSP	Basic State Pension
CPI	Costumer Price Index
DB	Defined Benefit
DC	Defined Contributions
DOB	Date of Birth
DOC	Date of Calculation
DOL	Date of Leaving
DOR	Date of Retirement
DPSC	Date Pensionable Service Commenced
GMP	Guaranteed Minimum Pension
GPA	Guaranteed Pension Age
GPD	Guaranteed Payment Date
HMRC	Her Majesty's Revenue and Customs
LSC	Lisbon Service Centre
NIC	National Insurance Contributions
NPA	Normal Pension Age
NRA	Normal Retirement Age
NRD	Normal Retirement Date
S2P	State Second Pension
SERPS	State Earnings Related Pension Schemes
SPA	State Pension Age
RPI	Retail Price Index
UK	United Kingdom
WTW	Willis Towers Watson

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1. Introduction

This report is the result of a five month internship focused in pension valuations, accommodated at LSC – Lisbon Service Centre. LSC is part of Willis Towers Watson (WTW) which operates all over the world.

In the beginning of the internship we were introduced to the values of Willis Towers Watson, what they stand for and their mission. It proceeded with a month of training, which was given to us by our colleagues, who were very encouraging and helpful. The training helped us get an understanding of how a valuation works and of the internal software used, Excel and the inbuilt WTW Excel functions. Moreover, it helped on getting a perspective of the practical side of actuarial science, the theories and concepts we had studied during the first and a half years of the masters. All throughout the training, every process was taught to us through practical examples, which assisted us in becoming more familiar with the software before starting the real client work.

The topic chosen as the subject of this work, the equalisation of the guaranteed minimum pensions (GMP) in the United Kingdom (UK), was driven from the circumstance that the UK Pension System at this point in time is dealing with an issue that has been there all along, but was never solved due to its complexities. As a matter of fact GMP inequalities between man and women have existed since members of pension schemes first started to accrue GMP, after being contracted out of State Pension Schemes and contracted into a Private Pension Scheme. This problem came insight after trustees of Lloyds Bank decided to send the case to court in 2018 (WTW, 2018a). Lloyds Judgment brought to light the fact that, yes, GMP between man and women needs to be equalised, however the rest of the process was left to be decided from the pension schemes themselves.

I was curious to dig into this subject because it's been a topic of discussion recently and it was interesting to understand the several methods that are being proposed on how to solve this inequality issue. Although I wasn't able to get the opportunity to work directly with GMP equalisation for pension schemes, I had the privilege to get into contact with colleagues that are working on it now, who helped me further understand this problem and work on some practical solutions and examples. I expect this report to expose to all who read it some of the most daring questions and difficulties UK pension schemes are facing right now. In the end, this paper does not focus on the right way to equalise GMP, but more on exploring the various ways it could be done.

The structure of this paper is as follows. Chapter 2 gives a brief introduction of UK Pension System and how different pension schemes work. Chapter 3 presents the Guaranteed Minimum Pension, where details on what GMP represents, how it is calculated, and its features are given. Chapter 4 is the core of the text, as it brings a better explanation on why GMP inequalities between men and women exist, what they are caused by and which ones, between male and female members are favoured by them. It further explains in details the Lloyds Judgment, and who is affected by it, and introduces us to what GMP equalisation means and how it can be achieved. The chapter closes with a description of the methods that have been approved until now, followed by a few illustrations. Chapter 5 contains the main conclusions and other final thoughts.

2. UK State Pension System

A retirement pension is a regular stream of payments, made during retirement, usually by Social Security or a pension scheme. Retirement pensions are payable until the death of the pensioner. In some cases, pensions are payable until a certain age, for instance, pensions payable to a dependant person.

For retirees, pensions represent the replacement of the income that they were receiving while active. Consequently, pensions are their main source of income in retirement, essential for them to maintain an acceptable standard of living.

The UK State Pension System is divided into three main sections:

I. **The State Pension System**
II. **The Private Pension System**
III. **Public Service Pension Schemes**

I. The State Pension System

The statutory State Pension System in the UK is made up of the basic state pension (BSP) and the additional earnings related pension, the latter known as the state second pension (S2P). The S2P represents a top-up pension that before 2002 was known as the State Earnings Related Pension Schemes (SERPS) (HM Treasury, 2014).

For a state pension, both the employers and employees pay what is called National Insurance Contributions (NICs). The NICs are calculated as a percentage of earnings at a rate that is specified by the government. Employers and employees contribute or pay their NICs until the employee reaches his or her State Pension Age (SPA).

The State Pension Age is the age at which the pension can be claimed and is 65 for both male and female members. It has been gradually increasing through the years and is expected to increase to 66 by 2020, and to 67 between 2026 and 2028.

According to the legislation the basic state pension is uprated in line with annual average-earnings increases although it can be uprated by a different index if the government gives the discretion for that.

In April 2016 the Single Tier state pension was introduced. The single tier pension provides more certainty to people when it comes to them knowing how much of the state pension they are expected to receive upon retirement.
For a person to receive the state pension, a minimum of 10 working years is needed, meanwhile to receive the full state pension 25 years of contributions are needed (HM Treasury, 2014).

II. The Private Pension System

The private pension system consists of occupational schemes and personal pension schemes.
Occupational pension schemes are set up by employers, who are obliged to register their workers. They are divided into:

- Defined Benefit (DB) – pensions based on total service and final salary, or on career average revalued earnings (CARE).
- Defined Contribution (DC) – benefit is paid based on contributions and investment performance.

As for personal pensions, these are largely DC schemes that are in force for those who often change jobs or that do not have access to an occupational pension scheme.
For this type of system, the minimum retirement age is 55.

III. Public Service Pension Schemes

Public Service Pension Schemes are paid for individuals that are employed in the public sector, in addition to the state pension.
There is no statutory retirement age. Instead, there is a SPA, after which the state pension can be revised, whether or not the individual has retired. The state pension cannot be taken before the SPA; however, it may be taken later and a corresponding bonus is applied.

3. Guaranteed Minimum Pension

Since 1978 the UK government allowed schemes to "contract out" a part of their members' S2P, meaning that the scheme would be responsible for paying this benefit instead of the government. By contracting out, the members would pay equivalent or lower NICs to the scheme and in return receive at least the same level of pension as the S2P they were giving up. Contracting out was implemented on a scheme level as individual choices where not implemented. However, for a scheme to be able to contract out certain criteria had to be met:

- From 6 April 1978 to 5 April 1997 schemes had to provide a minimum level of pension.
- From 6 April 1997 to 5 April 2016, contracted out salary related schemes had to satisfy the Reference Scheme Test.

The contracted-out schemes consisted of defined benefit schemes mostly, as these were the ones who met the criteria set by the government.

This new pension provided by a scheme that was contracted out between 6 April 1978 and 5 April 1997 is the Guaranteed Minimum Pension (GMP). Therefore, for a contracted out pension scheme, the pension is comprised of two components, the GMP Pension and Excess Pension.

GMP follows rules set out by the state, while Excess follows scheme specific rules. These rules dictate the age at which the benefit can start being paid and the increases that each component receives once it is in payment (WTW, 2016).

With the introduction of the single tier pension contracting-out was abolished on 6th April 2016 when the government introduced a new flat rate pension or a single tier pension. As a result, for members who have accrued it, from 2016 until GPA is reached GMP is revalued as excess though at a higher rate (WTW, 2016). What revaluation means is simply applying increases where older earnings will receive higher increases than the more recent earnings.

GMP is split in two components:

1. **Pre 88 GMP**

   This part of GMP is accrued from 06/04/1978 to 05/04/1988. It is calculated as follows:

$$Pre\ 88\ GMP = \frac{Earnings}{Contribution\ rate * Accrual\ Rate} \tag{3.1}$$

Where:

Earnings – the members' earnings during the specified time period;

Contribution Rate is employee contribution rate;
Accrual rate $= 4 \times$ "$Working\ Life$".

2. Post 88 GMP

This part of GMP is accrued from 06/04/1988 to 05/04/1997. It is calculated as follows:

$$Post\ 88\ GMP = \frac{Earnings}{Contribution\ rate * Accrual\ Rate} \quad (3.2)$$

Where:
Earnings – the same meaning as before;
Contribution Rate is employee contribution rate;
Accrual Rate = $5 \times$ "$Working\ Life$".

Working Life represents the number of complete tax years between the start date and the end date of GMP accrual. Working life is subject to a minimum of 20 and a maximum of 49 for males and 44 for females. The maximum is the difference between 16 and the GPA, because age 16 is considered the minimum working age.
The start date of counting the tax years is 6 April 1978, unless the members turns 16 after this date in which case the start date is 6 April of the year of their 16th birthday.
The end date is the 5th of April before GPD. The reference to 5 April rather than 6 April is to avoid counting the tax year of the member's GPD (WTW, 2019a).

3.1 Features of GMP

In order to understand GMP there are two terms that need to be defined:

- GMP payment age (GPA) – which as mentioned earlier is 65 for males and 60 for females
- GMP payment date (GPD) – date from which GMP is payable. Date turned 65 for males and date turned 60 for females

GMP pension gets revalued to NRA according to the statutory increases or through a certain method depending on the scheme approach.
In cases when NRA is before GPA, the increase in payment is done as follows:

- GMP is included in the pension but it is notional GMP until GPA is reached. This means that all pension is treated as excess.
- When the member reaches GPA, GMP "kicks in" and the total pension is divided into GMP pension and Excess pension.

In cases when NRA is after the GPA, the whole pension is split since the beginning and both parts, the GMP and Excess are revalued separately.

To be able to track GMP pension forward from date GMP stops being accrued to GPD, attention should be given at how GMP is revalued from date of leaving to GMP payment date, what pension increases are granted in payment, how to calculate the uplift if a member retires after GMP payment date and how to calculate a spouse's GMP pension.

3.1.1 GMP revaluation to GMP Payment Age

GMP pension is subjected to revaluation. This needs to be done in those cases when a member is entitled to a GMP but leaves service before GMP Payment Age. Therefore, their GMP will need to be "revalued" up to GPA by one of the following methods:

- Section 148 revaluation;
- Limited rate revaluation (Pre 97 leavers only);
- Fixed rate revaluation.

Section 148 Revaluation

Section 148 Orders are based on the increase in the National Average Earnings index each year and schemes may opt to consider it for in deferment increases and it will look for the complete tax year contracting out ended to tax year preceding the tax year where GPD falls (WTW, 2019a). This is equivalent to increasing GMP on each 6 April between date of leaving and the 6 April prior to GPD because for that year the member would not be working a full tax year.
It should be noted that all the examples provided in this paper are revalued using Section 148 orders, unless stated otherwise.

Example 3.1

- Date of leaving: 01/03/1984
- GPD: 01/10/2014
- GMP at date of leaving of £5.77 a week

The revaluation using Section 148 order from 1983/84 to 2013/14 is 334.5% (taken from UK statistics, see appendix). In this case we have 30 revaluations:

$$Increase\ to\ apply = 1 + \frac{334.5}{100} = 4.345 \tag{3.6}$$

Applying the 4.345 increase to the GMP, the member would end up with a GMP equal to £25.07 a week at his GMP payment date.

$$Revaluing\ with\ the\ applied\ increase = £5.77 * 4.345 = £25.07\ a\ week \quad (3.7)$$

Limited rate revaluation

Limited revaluation is based on the increase in the National Average Earnings index each year, limited to a 5% cap pa. (WTW, 2019a).

Limited rate revaluation only applies to members that left before 6 April 1997. It considers the minimum between Section 148 orders and a cumulative cap of 5% for each complete tax year from date contracting out ceased until GPD. It was abolished for leavers after 1997.

The Limited rate revaluation can be attained through Section 148 by considering *n* as the number of complete tax years between date contracting out ceased (e.g. date of leaving) and GPD, which would result in:

$$Limited\ Rate\ Revaluation = \min(1.05^n, Section\ 148\ revaluation) \quad (3.8)$$

Example 3.2

Using the same exaple as the one used for Section 148 revaluation:

- Date of leaving: 01/03/1984
- GPD: 01/10/2014
- GMP at date of leaving of £5.77 a week

For this example, there are 30 complete tax years from date of leaving to GPD and the 5% pa bites:

$$1.05\text{^}30 = 4.322 < Section\ 148\ order\ of\ 4.345 \quad (3.9)$$

resulting in:

$$Limited\ Rate\ Revaluation = £5.77 * 1.05^{30} = £24.94 \quad (3.10)$$

Fixed rate revaluation

Under Fixed rate revaluation the revaluation rate depends on the date the member left the scheme. (WTW, 2019a).

The GMP is increased at a fixed rate for each complete tax year between the date contracted out ceased (e.g. date of leaving) and GPA

The table below summarises the increases already defined for different periods of time depending on the date of leaving:

Leaving date		Revaluation rate per annum (%)
Before 06/04/1988		8.5
Between (both end dates included)	06/04/1988 – 05/04/1993	7.5
	06/04/1993 – 05/04/1997	7
	06/04/1997 – 05/04/2002	6.25
	06/04/2002 – 05/04/2007	4.5
	06/04/2007 – 05/04/2012	4.0
	06/04/2012 – 05/04/2017	4.75
On or after 06/04/2017		3.5

Table 1: Fixed rate revaluation increases
Source: WTW, 2019a

Example 3.3

One more time, using the same example:

- Date of leaving: 01/03/1984
- GPD: 01/10/2014
- GMP at date of leaving of £5.77 a week

Since this member's date of leaving is 01/03/1984, form the table above it can be seen that the fixed rate revaluation to be applied is 8.50% pa.

Moreover, the number of complete tax years to consider is 30.

$$\text{Therefore, } GMP\ at\ GPD\ is\ =\ £5.77\ x\ 1.085\text{^}30\ =\ £66.69\ a\ week \qquad (3.11)$$

3.1.2 Statutory increases to GMPs in payment

When GMP comes into payment it receives pension increases every year on 6th of April. Statutory increases represent the minimum level of increases a scheme must provide for its members, which are:

- Pre 88 GMP – the statutory increases are 0%, however, schemes can consider increases

- Post 88 GMP – The statutory rules consider this part of the GMP to receive in payment increases in line with inflationary increases capped at 3% pa, however, there are schemes that can consider greater increases.

For Post 88 GMP the RPI increases were the measure of inflation up until April 2010, but they were changed to be CPI inflation increases from April 2011, related with the September index (WTW, 2019a). These increases are granted in full, meaning there are no allowances for partial first year increase. It is worth mentioning that if GPD is the 6th of April the pension increase for that year is not granted.

3.1.3 Late retirement uplifts

In the event that a member retires at least 7 weeks after GPD then statutory uplifts are applied to the members' GMP. The late retirement uplift has two components:

1. $Uplift = 1 + number\ of\ complete\ weeks\ GMP\ is\ paid\ late\ /\ 700$ (3.12)
2. Plus missed GMP payment increases

The uplift is applied to both Pre 88 and Post 88 GMP where the number of complete weeks between GMP payment date and retirement date should be counted.
The missed pension increases only apply to Post 88 GMP where the pension increases that the member wold have received had they retired at GMP payment date should be calculated, unless scheme considers increases to the pre 88 GMP.

Example 3.4

Assuming that a member's Post 88 GMP per week is £10 at GPD. If this member retires 2 years after GPD, it means that GPD will start 104 weeks later than it was expected to if the member had retired at their GPD.
Therefore, the uplift that the member needs for those 2 extra years and the increases the member would have received if the GMP was in payment should be calculated and given to the member.
The GMP at date of retirement with the uplift and the missed increases applied would be:

$$GMP\ at\ date\ of\ retirement = £10.00 * \left(1 + \frac{104}{700}\right) * 1.01\ x\ 1.02 =$$

$$£11.83\ pw\ (£615.16\ pa) \quad (3.13)$$

Assuming the missed pension increases are 1% and 2%.

3.1.4 Spouse's pension entitlement

When a member of a pension scheme has a spouse and in the event of the member's death, the spouse is entitled to a pension.

If the members' date of death is after the GMP payment date, then the member's GMP at date of death is what the spouse is entitled to. That means that the spouse will receive the members GMP at GPD plus the pension increases and any retirement uplift if the original member was entitled to it.

On the other hand, if the members' date of death is before GMP payment date then the spouses GMP is calculated by revaluing the GMP between date of leaving and date of death. This basically means that the date of death is considered to be the GMP payment date and the GMP starts being paid to the spouse of the original member.

	Widows (female spouse)	**Widowers (male spouse)**
Pre 88 GMP	50% of members GMP at date of death	Treated as excess from date of member's death
Post 88 GMP	50% of members GMP at date of death	50% of members GMP at date of death

Table 2: Spouses GMP entitlement
Source: WTW, 2019a

3.2 Worked example

Consider a member from a pension scheme that has contracted out and is entitled to GMP. It is worth mentioning that this example is only for one member, and is only used to show step by step how GMP is calculated. Moreover, GMP represents only a fraction of the whole pension that the member is entitled to which is why the amounts used throughout these calculations are not high.

- Sex: Male
- Date of birth: 05/10/1955
- Date contracting out commenced: 06/08/1985
- Date contracting out ceased: 03/05/1991

Step 1: Obtaining earning figures

For Pre 88 GMP the earnings figures need to be calculated as the ratio of NI contributions and the contribution rate since they are not directly known. For Post 88 GMP the earnings are already defined and only revaluation needs to be applied.

Tax year	Earnings	NI Contributions	Contribution rate	Earnings
1985/86	N/A	£400.00	6.85%	£5,839.42
1986/87	N/A	£800.00	6.85%	£1,1678.83
1987/88	£12,000.00	-	-	£12,000.00

Table 3: Earnings figures of the member for example 1
Source: WTW, 2019a

From the table above, £12,000.00 represents the member's earnings that begin from 6 April 1987 not on 6 April 1988 and the contribution rates are pre-defined in the appendix given by the UK statistics.

Step 2: Revaluing earnings

To revalue the earnings up to date contracting out ceased. Using Section 148 revaluation orders, the years of earnings between 85/86 tax year to the 91/92 tax year are revalued:

Tax year	Earnings		Section 148 orders		Revalued earnings
1985/86	£5,839.42	*	1.658	=	£9,681.76
1986/87	£11,678.83	*	1.523	=	£17,786.86
1987/88	£12,000.00	*	1.419	=	£17,028.000
1988/89	£13,000.00	*	1.304	=	£16,952.000
1989/90	£14,000.00	*	1.182	=	£16,548.000
1990/91	£15,000.00	*	1.101	=	£16,515.000
1991/92	£16,000.00	*	1.000	=	£16,000.000

Table 4: Earnings revaluation for example 1
Source: WTW, 2019a

Note: Note that the calculation is to derive the GMPs until contracting out ceases (e.g. member leaves active service in this scheme) and Section 148 orders considers the number tax years until the tax year of this date. So, last tax year of earnings should not get any revaluation (if the member left before 06/04/1997, hence why in this case it is 1).

Step 3: Summing Pre and Post 88 GMP

$$Pre\ 88\ revalued\ earnings = £9{,}681.76 + £17{,}786.86 + £17{,}028.000 = £44{,}496.62$$

$$Post\ 88\ revalued\ earnings$$
$$= £16{,}952.000 + £16{,}548.000 + £16{,}515.000 + £16{,}000.000$$
$$= £66{,}015.000$$

Step 4: Calculating Working Lifetime

Start date of GMP accrual is 06/04/1978 if the member started working before that date. In this case the member started working on 16 and his 16th birthday was in 1971 therefore this member accrued GMP since the beginning of GMP, and the end date should be at GPD which for this male member is 05/10/2020.

This gives 42 complete tax years between the start date and the end date, therefore *Working Lifetime is 42 years.* Also to keep the consistency between the minimum and maximum requirements, it can be seen that this number is higher than 20 and lower than 49.

Part two of the last step is to divide the revalued earnings by accrual rate, where multiplying it by 52 (number of weeks in a year) we will get the annual figure. Therefore we will have:

$$Pre\ 88\ GMP = \frac{\left(\frac{44496.62}{42*4}\right)}{52} = £5.09\ (weekly) = £264.68\ (annualy) \quad (3.3)$$

$$Post\ 88\ GMP = \frac{\left(\frac{66015.179}{42*5}\right)}{52} = £6.05\ (weekly) = £314.60\ (annualy) \quad (3.4)$$

At the end the total GMP of the member is given by the sum of these two values:

$$Members\ Total\ GMP = £264.68 + £314.60 = £579.28\ (annualy) \quad (3.5)$$

4. GMP inequalities and Lloyds case

4.1 What is unequal about GMPs?

When determining the GMP, there exists many inequalities between the accrual of the GMP for male and female members. The inequality is caused mainly due to differences in the GMP payment ages, where it is 60 for female and 65 for male members, on which the accrual rate is based. The accrual rate is inversely proportional to the working lifetime of the member, since the female has a lower GMP payment age, she will have a lower working lifetime and therefore have a higher accrual rate compared to the male member. This inequality in the GMP payment age will always favour the female members.

Furthermore, the late retirement uplift and revaluations applied when equalising have a higher impact on the GMP for female members than for male members.

The diagram below shows the GMP inequalities between male and female members. It shows the differences in pension at date of leaving to date of retirement for members that retired from the deferred status, but it is applicable also for members that retire from active status.

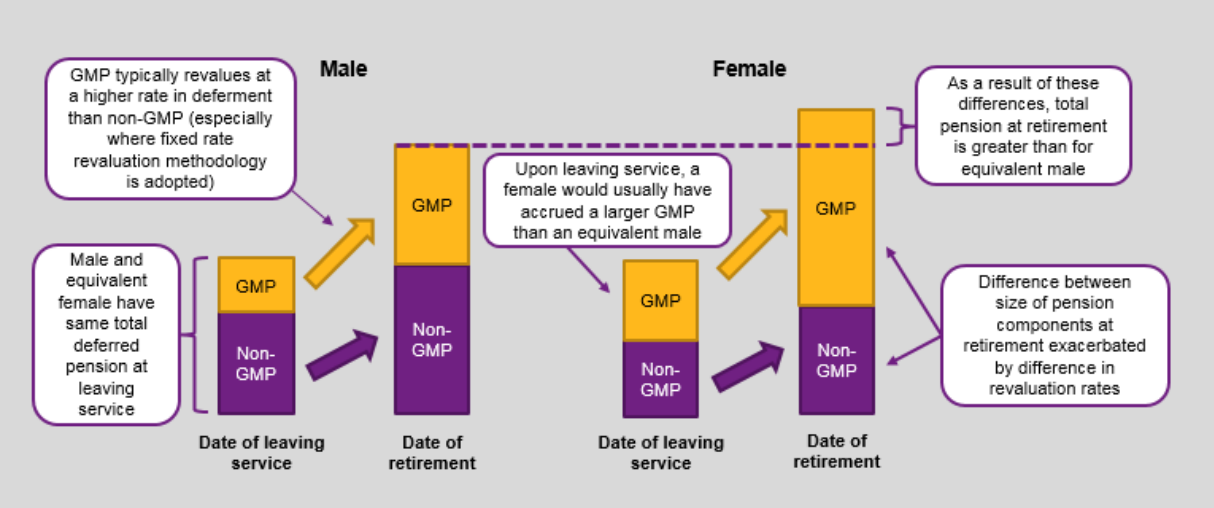

Figure 1: GMP differences between male and female members that retired from deferred status
Source: Sackers, 2019

To begin with, both male and female members have the same date of birth, same scheme service dates and the same earnings data. Therefore both members should have the same pension at date of leaving, since the sum of Pre 97 excess (the remaining part of the pension) pension and GMP pension for male and female should be the same.

On the other hand, since female GMP has a higher accrual rate it is expected that the female proportion of GMP pension at date of leaving to be higher.
So far, the date the members leave the company, this is only a difference of the GMP and non GMP parts of the pension for both the female and male members. The rest of the pension amounts are the same.

But, since GMP typically receives higher increases between date of leaving and date of retirement, compared to the non-GMP pension, female members end up having a higher pension on date of retirement than their male counterpart because of the larger GMP on date of leaving, which gets higher increases.

When the pension comes in payment there are cases when the male member can be in favour. As an extreme example it can be assumed that all GMP is Pre 88 GMP, implying it does not get any increase in payment, and excess pension gets fixed 3% increases. In this example the male member would have more excess pension and a higher pension increase given enough time, which can result in overtaking the female pension.
This shows that the pension difference between equivalent male and female members starts at zero from date of leaving but can variate up and down, depending on different factors.

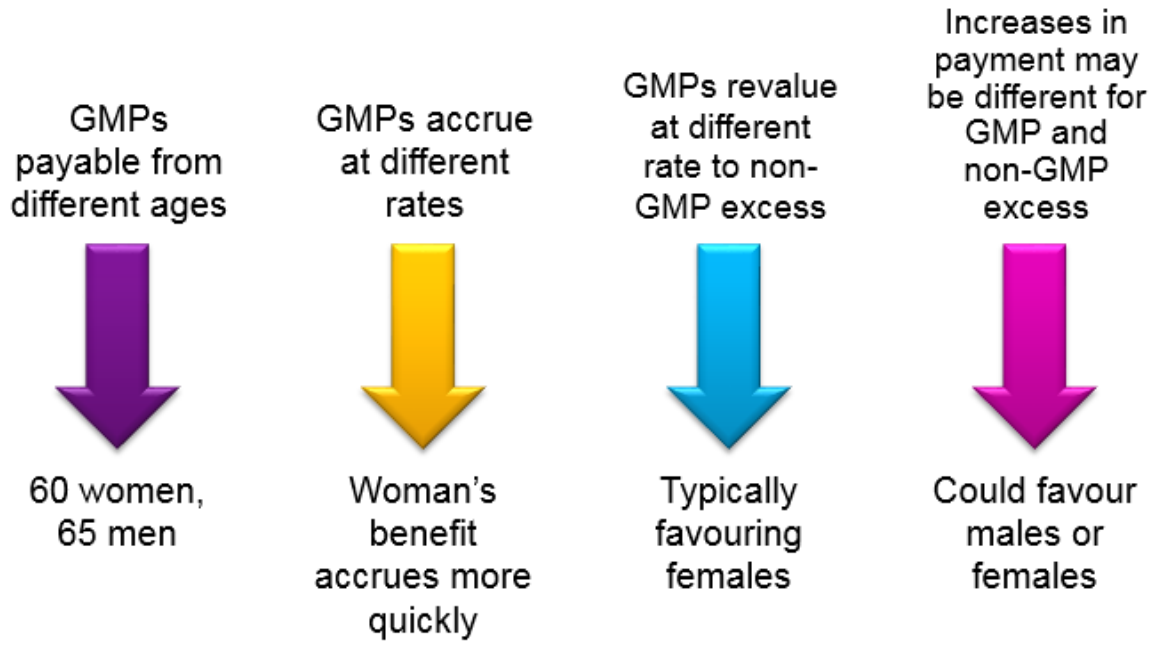

Figure 2: Factors that cause inequalities in GMP
Source: WTW, 2019b

4.1.1 Lloyds case

The GMP inequality between male and females has been known for a while now. In particular there was a judgment on 17 May 1990, in respect of the Barber case, (WTW, 2019b) resulting in a verdict that men and women had the right to equal pay from occupational pension schemes. However, because GMP was complicated enough beforehand there was no clear solution about how to actually equalise the amounts.

This uncertainty remained until the Lloyds Banking Group judgement, in October 2018 (WTW, 2018a). The High Court decided that trustees should correct differences in pensions for men and women for the future and pay arrears for the past, but employers have a word to say about the costs to implement the decision. The reason this was a big deal was because it created a precedent for all other UK pension schemes with GMP.

In summary, the key issues of this case are (WTW, 2018b):

1. Are pension schemes obliged to equalise benefits?
2. If so, how should it be done? What method should be used?
3. The past period a member can claim their underpaid benefit.
4. How will the transferred into and out of benefits of the relevant schemes be treated?

First and foremost, GMP equalisation is required i.e. schemes have to do something to make up for the GMP inequalities. For this to happen some acceptable methods have been suggested, which focus on a year by year test. Since different acceptable methods result in different costs, the employer can force the trustee to go for the less expensive one, according to the principle that trustees must minimize interference with the employer's funding obligations.

As the GMP equalisation process unfolds, it is seen that the cost of GMP equalisation is two-fold. Schemes need to fix pensions going forward but they also need to make back payments for members that have been underpaid. Where back payments are made, a decision was made that simple interest should be applied and the interest rate should be 1% over base rate p.a. to reflect the value of money. This tries to compensate members for the income they could have received if they had received these payments when they were due and invested them. Lastly the Court decided it was possible to sort out GMP equalisation through GMP conversion which offers interesting ways for schemes to solve the problem.

4.1.2 Who is affected by the High Court´s decision?

GMP equalisation is expected to affect all the interested parties. To start with, members that earned GMP between 17 May 1990 and 5 April 1997 will be entitled to additional benefits. For some members the uplift can be over 10%. This period is important as it is the date of the Barber judgment that specified the need for equal pension treatment between man and women. After members, trustees represent the second party affected by the equalisation. They have the responsibility to pay the right benefits, making policy decisions and communicating with members regarding the changes that have occurred. The company or employer should also be concerned because additional benefits cost money. They will have to allow for recognition of GMP equalisation in their accounts and the journey planning of the company. It should be noted that on a scheme level it is expected that the scheme liabilities will have an increase approximately around 3% due to equalisation. Lastly, GMP equalisation will bring implications for scheme administrators, legal advisors and insurers, depending on the circumstances, which are parties that also need to know the correct amounts of the benefits.

4.2 GMP equalisation

Lloyds Judgment stated that GMP equalization is required. This means that the GMP inequalities between male and female members need to be corrected. Therefore, it involves a comparison between a member's GMP at date of leaving and the equivalent GMP the member would have received, if he/she was the opposite sex (WTW, 2019c).
Constructing the opposite sex basis by calculating the GMP from scratch would be time consuming and more often than expected data is not readily available.
A much quicker approach (WTW, 2019b) is to adjust each member's Post 88 GMP by:

(i) Calculate 90 to 97 Pension, and then
(ii) Adjusting the pension for fundamental differences in the GMP calculation between males and females (e.g. different working lifetimes and GMP ages).

This approach is expected to be used widely in GMP equalisation as it allows for calculations to be completed far more efficiently.

4.2.1 How to calculate opposite sex GMP?

As it has already been mentioned, in most of the cases it is expected for the GMP equalisation to be done by adjusting each members Post 88 GMP as if the member was the opposite sex.

This equalisation method represents a good approach since the equalised pension will give a clear "winner" at each age, meaning that either the male or female pension is higher at every age.

These cases are what's called "Opposite sex uplifts" and will be further developed using examples. The examples provided are illustrative examples that will help the reader understand how "Opposite sex uplifts" works, therefore simple amounts are used. Moreover, the examples are developed using weekly pension amounts due to the fact that some of the main formulas used to derive the pension work with weekly pension amounts.

Example 4.1: Male member left before age 60

Consider a male member born on 06/08/1960 who left active service on 03/05/2000 (DOL). His post 88 GMP at DOL is £19.00 per week.

The GMP payment age for a male member is 65 so the GMP payment date will be 06/08/2025. As GMP starts being accrued on 06/04/1978 the member's working lifetime, or the complete tax years he has worked, are 47 years (2025-1978).

On the other hand, the GMP payment age for a female member is 60 so if this member were female, the GMP payment date would be 06/08/2020. The member's working lifetime in this case would be 42 years.

Considering this information, the GMP at DOL if the member was female is

$$GMP_{Female} = GMP_{Male} * \frac{WL_{Male}}{WL_{Female}} = \text{£}19.00 * \frac{47}{42} = \text{£}21.26 \text{ weekly} \quad (4.1)$$

where:

WL_{Female} and WL_{Male} are the Working Lifetime of the female and male member

This example shows that a female member with the same date of birth, earnings and worked in the same period in time in the company (correspondent female record) will have a higher GMP than the male member due to the fact that they have different pre-defined GMP payment ages. In this case the uplift would be required for the male members GMP in order to obtain an equal GMP.

Example 4.2: Male member left after age 65

Considering a male member born on 03/05/1952 who left active service on 03/05/2018, after GMP payment date of 03/05/2017. Assume a pension increase of CPI 3% and that the members Post 88 GMP at DOL is £39.87 per week.

To obtain the opposite sex (female) GMP the aim is to work backwards from DOL to the female GMP payment age 60 and then apply the late retirement uplift factor using the following formula:

$$GMP_{Female} = GMP_{Male} * \frac{LRU_{Female}}{LRU_{Male}} * \frac{1}{Revaluation} * \frac{WL_{Male}}{WL_{Female}} \quad (4.2)$$

Where:

GMP_{Female} and GMP_{Male} are the Post 88 GMP at Date of Leaving;

LRU_{Female} and LRU_{Male} are the Late Retirement Uplifts of the female and male member respectively;

$Revaluation$ is the 5 year revaluation between age 60 and 65;

WL_{Female} and WL_{Male} are the Working Lifetime of the female and male member respectively;

As mentioned before, a member that retires after their GPA receives the late retirement uplift adjustment.

Step 1: So, the first step would be to remove the late retirement uplift the member has received from 65 (GPA) until DOL.

$$\text{Late retirement uplift male} = \left(1 + 1 * \frac{52}{700}\right) * 1.03 \quad (4.3)$$

- In this case the member left at age 66, meaning 1 year (52 complete weeks) later than his GPA. Therefore the 1 year pension increase (relevant CPI is equal to 3%) he would have received has been missed.

Step 2: Now considering the revaluation the member would receive, it is known that the male member would receive Section 148 revaluation up to the tax year preceding age 65 (2016/2017 tax year) whereas a female member would receive Section 148 revaluation up to tax year preceding age 60 (2011/2012 tax year).

- Therefore, the Section 148 revaluation between 60 and 65 needs to be removed by obtaining the revaluation between the 5 April before age 60 and 5 April before age 65.

$$Revaluation\ between\ 60\ and\ 65 = 1.083 \tag{4.4}$$

Step 3: After the revaluation is removed, the male working lifetime should also be converted to the female working lifetime. The working lifetime for the member is the complete tax years between 06/04/1978 and 03/05/2017, that equals to 39 years. Meanwhile if the member was female the working lifetime is the complete tax years between 06/04/1978 and 03/05/2012, that equals to 34 years.

Step 4: The next step is to add back the late retirement uplift and the pension increases a female member would have received:

- From age 60 (GPA) until DOL (age 66), a female member would have gotten late retirement uplift for 6 years (312 weeks).

$$Late\ retirement\ uplift = \left(1 + \frac{6*52}{700}\right) * 1.022 * 1.027 * 1.012 * 1 * 1.01 * 1.03 \tag{4.5}$$

- Since the member left at age 66, the 6 years pension increase (relevant CPI 3% increases are 2.2%, 2.7%, 1.2% 0%, 1% and 3% from 2013 to 2018) the member would have received has been missed have been added.

Step 5: After all these adjustments have been made, the female equivalent GMP will be calculated as follows:

$$Female\ Equivalent\ GMP = £39.87 * \frac{\left(1+\frac{6*52}{700}\right)*1.022*1.027*1.012*1*1.01*1.03}{1+\frac{1*52}{700}*1.03} * \frac{1}{1.083} * \frac{39}{34} =$$

$$£60.97\ (pw) \tag{4.6}$$

This example also shows that a female member will always have a higher GMP than the male member due to the fact that they have different pre-defined GMP payment ages. Therefore, also in this case the uplift would be required for the male members GMP in order to obtain an equal GMP.

Example 4.3: Male member left between age 60 and age 65

Considering a male member born on 03/05/1953 who left active service on 03/05/2016, before GMP payment date of 03/05/2018. Assume a pension increase of CPI 3% and that the members Post 88 GMP at DOL is £35.13 per week.

To obtain the opposite sex (female) GMP the aim is to work backwards from DOL to the female GMP payment age 60 and apply the late retirement uplift factor using the following formula:

$$GMP_{Female} = GMP_{Male} * \frac{LRU_{Female}}{LRU_{Male}} * \frac{1}{Revaluation} * \frac{WL_{Male}}{WL_{Female}} \quad (4.7)$$

Where:

GMP_{Female} and GMP_{Male} are the Post 88 GMP at Date of Leaving;

LRU_{Female} and LRU_{Male} are the Late Retirement Uplifts of the female and male member respectively;

$Revaluation$ is the 4 year revaluation between age 60 and 63;

WL_{Female} and WL_{Male} are the Working Lifetime of the female and male member respectively.

Step 1: The revaluation a male member has received from age 60 until Date of leaving needs to be removed since if the member was female the revaluation she would have received would have been until age 60.

- In this example DOL is in the tax year 2016/2017, meanwhile a female member would have received revaluation up to tax year 2012/2013. Therefore, the revaluation in this 4 year period should be removed.

$$Revaluation\ between\ 60\ and\ 63 = 1.063 \quad (4.8)$$

Step 2: After the revaluation has been removed, the working lifetime needs to be adjusted. The working lifetime of the male member is complete tax years between 06/04/1978 and 03/05/2018 = 40 years. Meanwhile, the working lifetime if the member was female is complete tax years between 06/04/1978 and 03/05/2013 = 35 years.

Step 3: Due to the fact that the female GMP payment age is 60, converting this GMP for a female member it means that the late retirement uplift factor should be added since the Date of Leaving now falls after the GMP payment date.

- From age 60 (GPA) until DOL (age 63), a female member would have gotten late retirement uplift for 3 years (156 weeks).

$$Late\ retirement\ uplift = \left(1 + \frac{3*52}{700}\right) * 1.027 * 1.012 * 1 \quad (4.9)$$

- Since the member left at age 63, the 3 years pension increase (CPI 3%) she would have received but missed, have been added.

Step 4: After all these adjustments have been made, the female equivalent GMP will be calculated as follows:

$$Female\ Equivalent\ GMP = £35.13 * \frac{Late\ retirement\ uplift}{1} * \frac{1}{1.063} * \frac{40}{35} = £48.00\ pw \quad (4.10)$$

This example also shows that a female member will always have a higher GMP than the male member due to the fact that they have different pre-defined GMP payment ages. Therefore, also in this case the uplift would be required for the male members GMP in order to obtain an equal GMP.

4.3 GMP equalization methods and applications

For GMP equalisation to be accomplished methods other than calculating the opposite sex uplifts have been proposed. As Lloyds Judgment did not specify which method is to be used, pension schemes can choose which one of the proposed methods they want to go with. What needs to be taken into account are the specifics of the scheme under which the best method that will make up for GMP inequalities should be used.

It should be kept in mind that the whole GMP equalisation process is in the beginning stages of development, which makes it hard to specify which one of the methods would be the best fit for most schemes. This means that exacts assumptions and formulae have not been constructed as to how the process will go. What these methods cover so far is the opportunities for schemes to decide as which approach suits them better, so that they devote themselves to further construct the assumptions and formulas according to their specifics.

The diagram below gives a summary of the methods proposed so far which are then further explained and shown through examples.

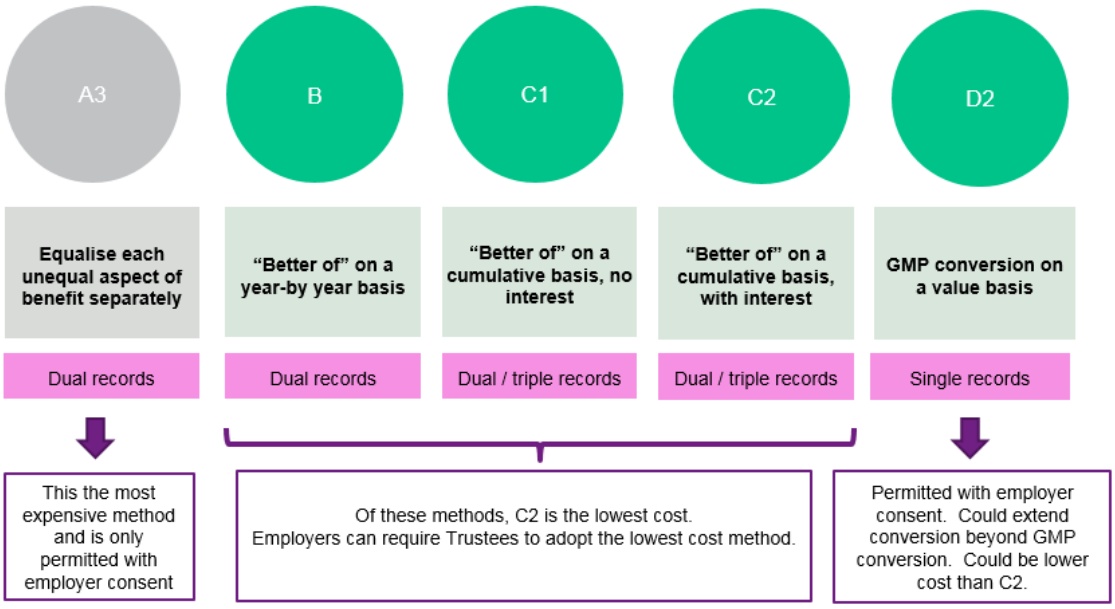

Figure 3: GMP equalization methods
Source: WTW, 2019d

Method A3 was the one that the Trustees of Lloyds bank pension schemes wanted to go with. It is the one where each unequal aspect of benefits is equalized.

In practice this means, looking at the Pre 88 GMP, Post 88 GMP and Pre 97 excess pension elements separately and paying the higher of the male or female Pre 88 GMP plus the higher of the male or female Post 88 GMP plus the higher of the male or female Pre 97 excess pension. If this method is used it is possible that members will end up with a higher pension than they would have been entitled to as the opposite sex. This would happen because each element is looked at separately. That is why this approach is expensive and the High Court infringed the "minimum interference clause" which states that this method should only be permitted with the employer agreement.

Method B is the same as A3 except that all the Pre 97 pension elements are combined. This means "*GMP +Excess"* where the higher of the Pre 97 pension as if the member is male or if the member is female is paid each year.

Method C1 is built up on method B. The cumulative pension since retirement if the member was male of female is taken into consideration. A check is performed every year that assesses which GMP is higher, and if the female cumulative pension is higher, then the female pension calculated under Method B is paid and vice versa.

Method C2 is built on Method C1. This means that on top of the cumulative pension since retirement there is interest applied to it. This approach makes this method the lowest cost method thus why it is assumed that employers might ask the trustees to follow it.

- Why method C2 is the lowest cost method?

Method B gives the pension amounts that need to paid, and shows the cross over age on when the male or the female pension should be paid. There can be more than one cross over age and this brings more costs when the scheme is trying to equalise the GMP. For this reason, Method C1 was proposed, and therefore is built on Method B. As mentioned earlier, Method C1 does not give the pension amount that needs to be paid, but it gives the cumulative of the pension amounts through the years, through which a pension scheme will be more confident on the cross over age of the members. This means that using the cumulative pension to determine which pension to pay out will help in determining better the cross over age and possibly reducing the risk of having more than one cross over age.
Meanwhile, Method C2 takes into consideration the cumulative pension with interest. As it is built on Method C1 this means that a pension scheme is taking into account the cumulative pension, plus applying to it interest that could be given out through the years. This guarantees the pension scheme that they are applying the right cross over age for the equalisation to be done, therefore there won't be more changes required. This will reduce the cost of the equalisation due to the fact that the scheme will have a clear "winner" between the male and female members removing the need for extra work, therefore reducing the costs.

The last one is method D2, which is GMP conversion. What this method conveys is that the actuarial value of the unequalised male and female pensions should be considered and the more valuable of the two should be converted to a new benefit structure. Before conversion is applied, this method requires for the value of the pension to be preserved but this depends on the assumptions used. Employer consent is required for this to be done since it can lead to big changes in pension or in the pension structure.
GMP conversion can be extended beyond equalisation, if the Trustees wish to stop working with GMP altogether and want to convert it into a "well behaving" pension. Since GMP conversion is a more broad approach it will be further discussed into detail in the next section. Since the employers can require the trustees to adopt the lowest cost approach it is expected that method C2 will be the most used method and will possibly be implemented via method D2.

4.4 GMP Conversion (Method D2)

This is the last method that was proposed in the equalisation step and allows the process of substituting GMP with other actuarially equivalent pensions. This method is attractive because of the simplification of scheme benefits, as it assists the communication between members and is comprised of an easier ongoing administration. Conversion is built on a 10 stage process.

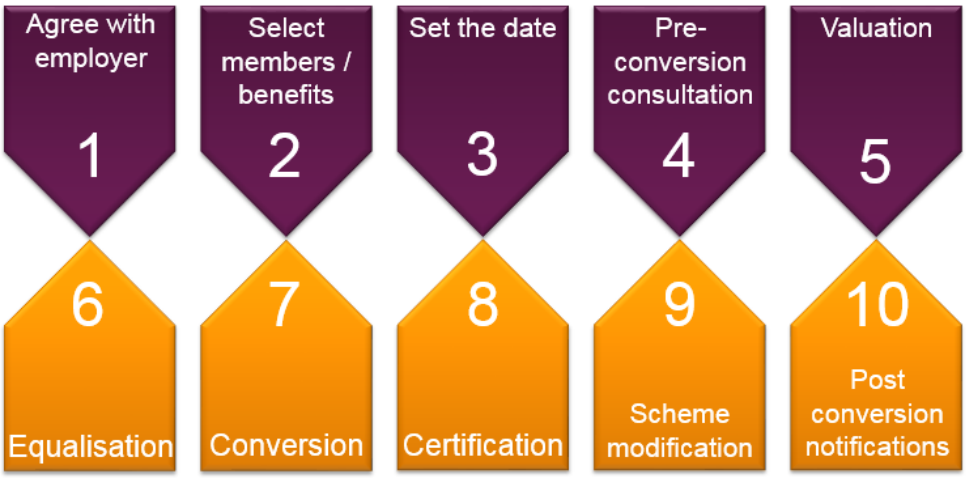

Figure 4: GMP conversion - stages of the process
Source: Sackers, 2019

It has different impact on members and schemes as it can be seen in the table below:

Member Impact	Scheme Impact
Benefits to members approaching retirement	Benefits to schemes
1. Simpler to understand Member communications can be simpler and therefore easier to understand, without having to cover the complexities that GMPs bring.	**1. Potentially reduced ongoing administration costs** Complex uplifts and checks related to GMP at retirement can be removed, making retirement calculations quicker and simpler for administrators to carry out.
2. **More freedom on benefits at retirement** The member will have fewer restrictions on early retirement and commutation of pension for a cash lump sum. Previously, a member's GMP may have been prevented them from retiring early or taking the full tax free cash lump sum, as there would not be sufficient pension available at GMP payment age. However, these constrains will be removed providing members with more flexibility.	**3. More efficient investment strategy** Converted benefits may make it easier to structure assets so that they match the schemes liabilities more closely.
	4. Closer to settlement Schemes may have the added bonus of getting closer to settlement of their liabilities with an insurer, as the simplified benefit structure could lead to cheaper prices.

Table 5: Impacts of implementing GMP conversion
Source: WTW, 2019d

GMP equalisation method depends on how the company decides to implement equalisation:

- If they choose to keep GMP than it is expected that they will choose between Methods B, C1 or C2.
- If they choose to convert GMP, then they will have a variety of conversion options available, as the conversion legislation provides flexibility. This may range between doing minimal changes to the Pre 97 pension and fully reconstructing it.

Implementing GMP conversion on existing administrative systems would be unproblematic, as it would prevent the need for "dual records", which is required through some other methods. Conversion would simplify the benefits such that it would be easier to explain them to members and it would possibly be easier to hedge and buyout.

But before schemes decide to take on conversion, there are some requirements to be met.

- It is necessary to make sure that post conversion benefits are at least equivalent to the pre conversion benefits. To do so, trustees need to get actuarial advice on what kind of assumptions to use, as they have not been set out in legislation. After deciding on the assumptions, the scheme actuary needs to calculate the converted benefits and at the same time to provide trustees with a certificate confirming the calculations. The certificate needs to prove that the pre and post conversion benefits are actuarially equivalent.
- Schemes need to make sure that conversion does not lead to a decrease of pensions in payment. On the other hand, if pensions in payment increase, HMRC tax free limits of receiving a pension may be violated.
- Benefits cannot be converted into money purchase benefits.
- The requirements for survivor's benefits should be kept the same as before conversion. Finally, before any changes are applied the company consent is required. All the affected members should be consulted in advance and HMRC needs to be notified.

4.5 GMP Calculations for Each Equalization Method

Under the proposed methods for GMP equalization, schemes need to go along the following steps:

1. Calculate the Post 17 May 1990, Pre 5 April 1997 pension at date of leaving
2. Calculate the equivalent opposite sex pension at date of leaving, that is,
   a) Calculate the equivalent, opposite sex GMP.
   b) The total pension at DOL should not be changed, so the 90-97 excess pension should be the balancing item.
3. Project the male and female pensions to NRA and for each subsequent month in payment.

4. For methods C1 and C2, calculate the cumulative total of pension payments each month, with and without interest.

- For method B, take the highest of the male and female pension each month.
- For method C1, in the first month take the highest of the male and female pension. In subsequent months, take the pension with the highest cumulative total with interest each month.
- For method D2, after the equivalent opposite sex pension at date of leaving has been calculated, the following steps should be covered:
    1. Calculate the present value (PV) of the male and female pensions.
    2. The equalized pension is as follows:
        a) If the member's actual pension has the highest PV, then no uplift is required.
        b) If the opposite sex pension has a higher PV, grant the member an additional pension with the same actuarial value as the difference between the two PV.
    3. For pensioners, a test is carried out to establish whether any back payments are due as a result of applying one of the other permitted equalization methods.
    4. Convert GMP to non-GMP pension.

4.5.1 Illustration – the XYZ scheme GMP equalisation process

The XYZ Pension Scheme has the following benefit structure:

- Normal Retirement Age is 60

GMP Pension

- Revalued in deferment with Fixed Rate Revaluation
- If NRA is before GPA; statutory minimum GMP is paid i.e. GMP at Date of Leaving
- For post 31 December 1985 leavers, the statutory minimum pension at GMP Payment Date is: GMP Revalued to GMP Age + Excess revalued to Normal Pension Age (NPA). In this case NPA = 60

Pre 97 Excess

- Receives statutory revaluation in deferment
- Receives statutory increases in payment i.e. the Pre 97 excess gets 0%

	Male	Female
DOB	01 March 1970	
DPSC	01 March 1986	
DOL	30 June 2001	
DOC	30 June 2019	
NRD	01 March 2030	
GPD	01 March 2035	01 March 2030
Fixed Rate Revaluation	6.25%	
Complete Years (DOL,NRD)	28	
Complete Years (DOL,DOC)	18	
C. Tax Y. (DOL,GPA)	32	27
Revaluation Order	1.538	
GMP Gender Conversion Factor	100%	111.4%

Unequalised pension accrued between 17 May 1990 and 5 April 1997	
Tranche of Benefits	Pension at DOL
Post 90 GMP	£500.00
Post 90 Excess	£500.00
Assumptions	
CPI (in deferment)	2.50%
Post 88 GMP in payment	2.00%
Interest rate (for C2)	3.00%

Table 6: XYZ Pension Scheme Details
Source: WTW, 2019b

For this pension scheme the equalisation will be done using the following procedure.

Step 1: Using the information given by the scheme it is seen that the male Post 90 GMP and Post 90 Excess at Date of leaving are £500.00**.** Taking this as the starting point the total pension is calculated from NRD (age 60) on.

For a male member it is known that GMP payment age is 65 therefore the difference between 65 and 60 needs to be accounted for. At the normal retirement date, GMP isn't revalued and therefore the pension at retirement is:

$$Post\ 90\ GMP_{NRA} = Post\ 90\ GMP_{DOL} = £500.00 \quad (4.11)$$

However, when the member reaches GPA the Post 90 GMP pension for a male member at GPA ($Post\ 90\ GMP_{GPA}$) is calculated through the following formula:

$$Post\ 90\ GMP_{GPA} = Post\ 90\ GMP_{DOL} * (1 + fixed\ revaluation\ rate)^{CTY(DOL,GPA)} \quad (4.12)$$

Where:

$CTY(DOL, GPA)$ is the Complete tax years between the age at Date of leaving and the GMP payment age.

Considering the member is already receiving a pension at GPA, the Post 90 GMP pension for ages X after the GPA, the following formula will be used:

$$Post\ 90\ GMP_{X>GPA} = Post\ 90\ GMP_{GPA} * (1 + Post\ 90\ GMP\ in\ payment\ rate)^{(X-GPA)} \quad (4.13)$$

The Post 90 Excess needs to be determined as well:

$$Post\ 90\ Excess = Post\ 90\ Excess_{DOL} * Revaluation\ Order * (1 + CPI(in\ deferment))^{[CY(DOL,NRD)-CY(DOL,DOC)]} \quad (4.14)$$

Where:

$CY(DOL, NRD)$ - the Complete years between the age at Date of leaving and the Normal retirement Date;

$CY(DOL, DOC)$ - the Complete years between the age at Date of leaving and the Date of Calculation;

Revaluation Order – represents the annual percentage increase in RPI/CPI index over previous September, with a cap of 5%, which applies to the whole period of calculation and is not dependent on a yearly basis. It is dependent on the complete years from DOL to NPA, calendar year of NPA, and whether the service was before or after 6 April 2009. Moreover, until 2010 it was based on September RPI index, from then on it is based on September CPI index. (WTW, 2016)

The Post 90 Excess receives statutory revaluations in deferment (for this scheme CPI = 2.50%) as schemes are obliged to provide their members with at least statutory increases.
Therefore, the yearly total Post 90 Pension is given by:

$$Total\ Post\ 90\ Pension = Post\ 90\ GMP + Post\ 90\ Excess \tag{4.15}$$

Male member			
Age	***Post 90 GMP***	***Post 90 excess***	***Total Post 90 pension***
DOL	500.00	500.00	1,000.00
60	500.00	984.39	1,484.39
61	500.00	984.39	1,484.39
62	500.00	984.39	1,484.39
63	500.00	984.39	1,484.39
64	500.00	984.39	1,484.39
65	3,479.33	984.39	4,463.72
66	3,548.92	984.39	4,533.31
67	3,619.90	984.39	4,604.29
68	3,692.30	984.39	4,676.69
69	3,766.15	984.39	4,750.54
70	3,841.47	984.39	4,825.86
71	3,918.30	984.39	4,902.69
72	3,996.67	984.39	4,981.06
73	4,076.60	984.39	5,060.99
74	4,158.13	984.39	5,142.52
75	4,241.29	984.39	5,225.68
76	4,326.12	984.39	5,310.51
77	4,412.64	984.39	5,397.03
78	4,500.89	984.39	5,485.28
79	4,590.91	984.39	5,575.30
80	4,682.73	984.39	5,667.12

Table 7: Total Post 90 Pension for the male member

Step 2: Calculate the equivalent pension at date of leaving for a female member by multiplying the female´s GMP gender conversion factor to the male Post 90 GMP. (Both Post 90 GMP and Post 90 Excess)

$$Post\ 90\ GMP_{DOL} = Post\ 90\ GMP_{DOL}(male) * GMP\ gender\ conversion\ factor \tag{4.16}$$

Where:

$$GMP\ gender\ conversion\ factor = \frac{Max\ WL_{Male}}{Max\ WL_{Female}} \tag{4.17}$$

From the scheme benefit structure, it is understood that the total Post 90 pension at DOL for male and female members should be the same, which is £1000.00.
Having the total Post 90 Pension at DOL and the Post 90 GMP at DOL for the female member, the Post 90 Excess pension at DOL can be obtained as the difference between the two:

$$Post\ 90\ Excess_{DOL} = Total\ Post\ 90\ Pension_{DOL} - Post\ 90\ GMP_{DOL} \quad (4.18)$$

For female members the GMP payment age is 60, which in this case it is the same as NRA. Therefore, the Post 90 GMP pension, which will start getting the payment increases immediately, is calculated using the following formula:

$$Post\ 90\ GMP_{X \geq GPA} = Post\ 90\ GMP_{GPA} * (1 + Post\ 90\ GMP\ in\ payment\ rate)^{(X-GPA)} \quad (4.19)$$

The Post 90 Excess needs to be determined as well:

$$Post\ 90\ Excess = Post\ 90\ Excess_{DOL} * Revaluation\ Order * (1 + CPI(in\ deferment))^{[CY(DOL,NRD)-CY(DOL,DOC)]} \quad (4.20)$$

Where:
$CY(DOL, NRD)$ is the Complete years between the age at Date of leaving and the Normal retirement Date;
$CY(DOL, DOC)$ is the Complete years between the age at Date of leaving and the Date of Calculation;
The Post 90 Excess is equal for all ages till age 80.

Therefore, as a final step the total Post 90 Pension for a female member is given by the same formula as the one for a male member:

$$Total\ Post\ 90\ Pension = Post\ 90\ GMP + Post\ 90\ Excess \quad (4.21)$$

Female member			
Age	***Post 90 GMP***	***Post 90 excess***	***Total Post 90 pension***
DOL	556.82	443.18	1,000.00
60	2,861.52	872.52	3,734.04

61	2,918.75	872.52	3,791.27
62	2,977.13	872.52	3,849.65
63	3,036.67	872.52	3,909.19
64	3,097.40	872.52	3,969.92
65	3,159.35	872.52	4,031.87
66	3,222.54	872.52	4,095.06
67	3,286.99	872.52	4,159.51
68	3,352.73	872.52	4,225.25
69	3,419.78	872.52	4,292.30
70	3,488.18	872.52	4,360.70
71	3,557.94	872.52	4,430.46
72	3,629.10	872.52	4,501.62
73	3,701.68	872.52	4,574.20
74	3,775.71	872.52	4,648.23
75	3,851.22	872.52	4,723.74
76	3,928.24	872.52	4,800.76
77	4,006.80	872.52	4,879.32
78	4,086.94	872.52	4,959.46
79	4,168.68	872.52	5,041.20
80	4,252.05	872.52	5,124.57

Table 8: Total Post 90 Pension for the female member

Step 3: After the total pension for both members has been calculated, the cumulative pension amounts for each member need to be defined. These values are obtained through the following formula:

$$Cummulative\ total_X = \sum_{x=60}^{X} Total\ Post\ 90\ Pension_x \quad where\ \ 60 \leq X \leq 80 \qquad (4.22)$$

Age	***Total Post 90 pension***	***Cumulative total***	***Total Post 90 pension***	***Cumulative total***
DOL	£1,000.00		1,000.00	
60	£1,484.39		£3,734.04	
61	£1,484.39	£1,484.39	£3,791.27	£3,734.04
62	£1,484.39	£2,968.78	£3,849.65	£7,525.31
63	£1,484.39	£4,453.17	£3,909.19	£11,374.96
64	£1,484.39	£5,937.56	£3,969.92	£15,284.15
65	£4,463.72	£7,421.95	£4,031.87	£19,254.07
66	£4,533.31	£11,885.67	£4,095.06	£23,285.94
67	£4,604.29	£16,418.98	£4,159.51	£27,381.00
68	£4,676.69	£21,023.27	£4,225.25	£31,540.51
69	£4,750.54	£25,699.96	£4,292.30	£35,765.76
70	£4,825.86	£30,450.50	£4,360.70	£40,058.06
71	£4,902.69	£35,276.36	£4,430.46	£44,418.76
72	£4,981.06	£40,179.05	£4,501.62	£48,849.22
73	£5,060.99	£45,160.11	£4,574.20	£53,350.84
74	£5,142.52	£50,221.10	£4,648.23	£57,925.04

75	£5,225.68	£55,363.62	£4,723.74	£62,573.27
76	£5,310.51	£60,589.30	£4,800.76	£67,297.01
77	£5,397.03	£65,899.81	£4,879.32	£72,097.77
78	£5,485.28	£71,296.84	£4,959.46	£76,977.09
79	£5,575.30	£76,782.12	£5,041.20	£81,936.55
80	£5,667.12	£82,357.42	£5,124.57	£86,977.75

Table 9: Total cumulative Post 90 Pension for male and female members

Step 4: Calculate the cumulative total pension with interest for at each age for the male and female member following the formula.

At time 61:

$$CTI_{61} = Cummulative\ Total_{60} * (1 + IR * 0.5) \quad (4.23)$$

Where:

CTI_{61} is the cumulative total with interest at age 61;

IR is the Interest Rate applied to the cumulative total.

At time *t* after 61:

$$CTI_t = CTI_{t-1} + IR * Cummulative\ Total_{t-1} + Total\ Post\ 90\ Pension_t * (1 + IR * 0.5) \quad (4.24)$$

and there may be more cases like this, where:

CTI_t is the cumulative total with interest at age t;

IR has the same meaning as before.

Age	***Total Post 90 pension***	***Cumulative total***	***Cumulative total with interest***	***Total Post 90 pension***	***Cumulative total***	***Cumulative total with interest***
DOL	£1,000.00			£1,000.00		
60	£1,484.39			£3,734.04		
61	£1,484.39	£1,484.39	£1,499.23	£3,791.27	£3,734.04	£3,771.38
62	£1,484.39	£2,968.78	£3,028.15	£3,849.65	£7,525.31	£7,734.21
63	£1,484.39	£4,453.17	£4,586.76	£3,909.19	£11,374.96	£11,833.00
64	£1,484.39	£5,937.56	£6,175.06	£3,969.92	£15,284.15	£16,070.12
65	£4,463.72	£7,421.95	£10,802.17	£4,031.87	£19,254.07	£20,447.99
66	£4,533.31	£11,885.67	£15,529.25	£4,095.06	£23,285.94	£24,969.08
67	£4,604.29	£16,418.98	£20,417.30	£4,159.51	£27,381.00	£29,635.90
68	£4,676.69	£21,023.27	£25,469.14	£4,225.25	£31,540.51	£34,451.02
69	£4,750.54	£25,699.96	£30,687.65	£4,292.30	£35,765.76	£39,417.05
70	£4,825.86	£30,450.50	£36,075.77	£4,360.70	£40,058.06	£44,536.67
71	£4,902.69	£35,276.36	£41,636.50	£4,430.46	£44,418.76	£49,812.60
72	£4,981.06	£40,179.05	£47,372.90	£4,501.62	£48,849.22	£55,247.61
73	£5,060.99	£45,160.11	£53,288.08	£4,574.20	£53,350.84	£60,844.54
74	£5,142.52	£50,221.10	£59,385.23	£4,648.23	£57,925.04	£66,606.27
75	£5,225.68	£55,363.62	£65,667.59	£4,723.74	£62,573.27	£72,535.75
76	£5,310.51	£60,589.30	£72,138.48	£4,800.76	£67,297.01	£78,635.98

77	£5,397.03	£65,899.81	£78,801.27	£4,879.32	£72,097.77	£84,910.03
78	£5,485.28	£71,296.84	£85,659.40	£4,959.46	£76,977.09	£91,361.04
79	£5,575.30	£76,782.12	£92,716.39	£5,041.20	£81,936.55	£97,992.19
80	£5,667.12	£82,357.42	£99,975.82	£5,124.57	£86,977.75	£104,806.74

Table 10: Total cumulative with interest Post 90 Pension for male and female members

Step 5: Compare using method B or C1 or C2.

At this step the comparison between the Total 90 Pension of both male and female member is done by using 3 of the proposed methods as follows:

- **Method B** – This method compares the Total Post 90 Pension of the male and female members where the pension to be paid is considered to be the highest of the 2 pension amounts at each age. It is seen that the Post 90 pension of the female member is higher until age 65 which represents the GPA of the male member. This means that the scheme should pay the female pension amount from age 60 to 65, after which it should start paying out the pension amount equal to the male member.

Age	***Total Post 90 pension***	***Total Post 90 pension***	***Pension to be paid under Method B***
DOL	£1,000.00	£1,000.00	
60	£1,484.39	£3,734.04	£3,734.04
61	£1,484.39	£3,791.27	£3,791.27
62	£1,484.39	£3,849.65	£3,849.65
63	£1,484.39	£3,909.19	£3,909.19
64	£1,484.39	£3,969.92	£3,969.92
65	£4,463.72	£4,031.87	£4,463.72
66	£4,533.31	£4,095.06	£4,533.31
67	£4,604.29	£4,159.51	£4,604.29
68	£4,676.69	£4,225.25	£4,676.69
69	£4,750.54	£4,292.30	£4,750.54
70	£4,825.86	£4,360.70	£4,825.86
71	£4,902.69	£4,430.46	£4,902.69
72	£4,981.06	£4,501.62	£4,981.06
73	£5,060.99	£4,574.20	£5,060.99
74	£5,142.52	£4,648.23	£5,142.52
75	£5,225.68	£4,723.74	£5,225.68
76	£5,310.51	£4,800.76	£5,310.51
77	£5,397.03	£4,879.32	£5,397.03
78	£5,485.28	£4,959.46	£5,485.28
79	£5,575.30	£5,041.20	£5,575.30
80	£5,667.12	£5,124.57	£5,667.12

Table 11: Pension to be paid under Method B

- **Method C1 –** Method C1 is built up on Method B.

  This method compares the cumulative total of the male and female member pension amounts where the pension pay-out is the total pension amount corresponding to the highest cumulative total between the 2.

  The cumulative total of the female member in this case is higher than the male member throughout the entire period. This implies that the total pension amount corresponding to the female cumulative total will be paid out until age 80.

Age	*Total Post 90 pension*	*Total Post 90 pension*	*Pension to be paid under Method C1*
DOL	£1,000.00	£1,000.00	
60	£1,484.39	£3,734.04	£3,734.04
61	£1,484.39	£3,791.27	£3,791.27
62	£1,484.39	£3,849.65	£3,849.65
63	£1,484.39	£3,909.19	£3,909.19
64	£1,484.39	£3,969.92	£3,969.92
65	£4,463.72	£4,031.87	£4,031.87
66	£4,533.31	£4,095.06	£4,095.06
67	£4,604.29	£4,159.51	£4,159.51
68	£4,676.69	£4,225.25	£4,225.25
69	£4,750.54	£4,292.30	£4,292.30
70	£4,825.86	£4,360.70	£4,360.70
71	£4,902.69	£4,430.46	£4,430.46
72	£4,981.06	£4,501.62	£4,501.62
73	£5,060.99	£4,574.20	£4,574.20
74	£5,142.52	£4,648.23	£4,648.23
75	£5,225.68	£4,723.74	£4,723.74
76	£5,310.51	£4,800.76	£4,800.76
77	£5,397.03	£4,879.32	£4,879.32
78	£5,485.28	£4,959.46	£4,959.46
79	£5,575.30	£5,041.20	£5,041.20
80	£5,667.12	£5,124.57	£5,124.57

Table 12: Pension to be paid under Method C1

- **Method C2** – Method C2 is built up on Method C1 by applying an interest factor to method C1.

  This method compares the cumulative total with interest of the male and female member pension amounts where the pension pay-out is the total pension amount corresponding to the highest cumulative total with interest between the 2.

The cumulative total with interest of the female member in this case is higher than the male member throughout the entire period. This implies that the total pension amount corresponding to the female cumulative total with interest will be paid out until age 80.

In conclusion the best method to use would be method C2, using the cumulative total with interest because it is considered to be the lowest cost method.

Age	*Total Post 90 pension*	*Total Post 90 pension*	*Pension to be paid under Method C2*
DOL	£1,000.00	£1,000.00	
60	£1,484.39	£3,734.04	£3,734.04
61	£1,484.39	£3,791.27	£3,791.27
62	£1,484.39	£3,849.65	£3,849.65
63	£1,484.39	£3,909.19	£3,909.19
64	£1,484.39	£3,969.92	£3,969.92
65	£4,463.72	£4,031.87	£4,031.87
66	£4,533.31	£4,095.06	£4,095.06
67	£4,604.29	£4,159.51	£4,159.51
68	£4,676.69	£4,225.25	£4,225.25
69	£4,750.54	£4,292.30	£4,292.30
70	£4,825.86	£4,360.70	£4,360.70
71	£4,902.69	£4,430.46	£4,430.46
72	£4,981.06	£4,501.62	£4,501.62
73	£5,060.99	£4,574.20	£4,574.20
74	£5,142.52	£4,648.23	£4,648.23
75	£5,225.68	£4,723.74	£4,723.74
76	£5,310.51	£4,800.76	£4,800.76
77	£5,397.03	£4,879.32	£4,879.32
78	£5,485.28	£4,959.46	£4,959.46
79	£5,575.30	£5,041.20	£5,041.20
80	£5,667.12	£5,124.57	£5,124.57

Table 13: Pension to be paid under method C2

5. Conclusion

As GMP represents one part of the pension of a contracted out scheme and its equalisation has been the main focus in the UK pension world, I thought it is important to analyse the methods proposed so far to remove its inequalities.

While working on this report, I saw that the main reason why GMP is unequal between male and female members is the difference in the GMP payment age which influences the accrual of GMP (e.g. the working lifetime).

Moreover, through the worked out example and the application of the methods proposed, one could be seen that out of the three methods, Method C2 is the one less expensive is expected to be used by most schemes.

On the other hand, the Lloyds judgment did not cover all the aspects that the schemes need to consider when equalising GMP. For example, "what happens with the contingency spouse's pension" or "what happens with transferred-in benefits who have had different ways of accumulating benefits/pension?" or "where do personal pension schemes fit into this process?" .Related to this, there is a subsequent court ruling on some questions schemes have asked and it is expected part of the questions around GMP equalisation will be cleared. Only after these points have been further discussed and more clarification on how these matters should be handled, the UK pension system will be able to remove the inequalities cause by GMP without raising extra complexities.

I believe that there are other unresolved matters that will need to be considered before equalisation takes place, in particular the data which represent the main source of information, and for which there's a current process of reconciliation and rectification of GMP data in schemes with HMRC information. After this process and the GMP equalisation process, schemes will most likely go through the process of GMP conversions. However, If there are GMP that need to be corrected before the equalization is done because pension payments or transfer of funds are done, it's possible that recalculation of benefits need to happen after these payments are done. This may involve further work on the GMP equalisation process for back-payments and/or back-transfer outs.

As warned in the introduction more than a writing that contains final answers and solutions, that really do not exist at the current stage, this paper rather raises the existing questions and difficulties and tries to put some light in the way to solve them.

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Appendix

Figure 20. **Section 148 Orders – revaluation of earnings factors (formerly Section 21 Orders)**

	Tax year of termination												
Tax year of earnings	**19/20 %**	**18/19 %**	**17/18 %**	**16/17 %**	**15/16 %**	**14/15 %**	**13/14 %**	**12/13 %**	**11/12 %**	**10/11 %**	**09/10 %**	**08/09 %**	**07/08 %**
1978/79	846.7	820.9	794.1	771.5	754.4	741.7	734.2	719.5	705.0	686.9	677.6	654.2	623.8
1979/80	735.6	712.8	689.2	669.2	654.1	642.9	636.3	623.3	610.5	594.5	586.3	565.7	538.8
1980/81	598.1	579.1	559.3	542.6	530.0	520.7	515.1	504.3	493.6	480.2	473.3	456.1	433.7
1981/82	484.6	468.7	452.2	438.2	427.6	419.8	415.2	406.1	397.1	385.9	380.2	365.7	347.0
1982/83	431.0	416.6	401.5	388.8	379.2	372.1	367.9	359.6	351.5	341.4	336.1	323.0	306.0
1983/84	393.1	379.6	365.7	353.9	345.0	338.4	334.5	326.8	319.2	309.8	305.0	292.8	276.9
1984/85	356.5	344.1	331.2	320.2	312.0	305.9	302.3	295.2	288.2	279.5	275.0	263.7	249.0
1985/86	328.3	316.6	304.5	294.2	286.5	280.8	277.4	270.7	264.2	256.0	251.7	241.2	227.4
1986/87	293.3	282.6	271.4	262.0	254.9	249.7	246.5	240.4	234.4	226.9	223.0	213.3	200.7
1987/88	266.2	256.2	245.8	237.1	230.4	225.6	222.7	217.0	211.3	204.3	200.7	191.7	179.9
1988/89	236.9	227.7	218.1	210.1	204.0	199.5	196.8	191.6	186.4	180.0	176.7	168.4	157.5
1989/90	204.0	195.7	187.1	179.9	174.4	170.3	167.9	163.2	158.5	152.7	149.7	142.2	132.4
1990/91	183.3	175.6	167.6	160.8	155.7	151.9	149.7	145.3	140.9	135.5	132.7	125.7	116.6
1991/92	157.3	150.3	143.0	136.9	132.2	128.8	126.8	122.8	118.8	113.9	111.4	105.0	96.7
1992/93	141.6	135.1	128.2	122.4	118.1	114.8	112.9	109.2	105.5	100.8	98.5	92.5	84.7
1993/94	130.1	123.9	117.3	111.8	107.7	104.6	102.8	99.2	95.7	91.3	89.0	83.3	75.9
1994/95	123.2	117.1	110.8	105.5	101.4	98.5	96.7	93.2	89.8	85.5	83.3	77.8	70.7
1995/96	113.8	108.0	101.9	96.8	93.0	90.1	88.4	85.1	81.8	77.7	75.6	70.3	63.5
1996/97	108.0	102.3	96.4	91.4	87.7	84.9	83.3	80.0	76.8	72.9	70.8	65.7	59.0
1997/98	98.1	92.7	87.1	82.3	78.8	76.1	74.5	71.5	68.4	64.6	62.7	57.8	51.4
1998/99	89.4	84.2	78.8	74.3	70.9	68.4	66.9	63.9	61.0	57.4	55.5	50.9	44.8
1999/00	81.7	76.8	71.8	67.3	64.0	61.6	60.1	57.3	54.5	51.1	49.3	44.8	38.9
2000/01	71.0	66.3	61.5	57.4	54.3	52.0	50.7	48.0	45.4	42.1	40.4	36.2	30.7
2001/02	64.4	59.9	55.3	51.3	48.4	46.2	44.9	42.3	39.8	36.6	35.0	31.0	25.7
2002/03	57.6	53.3	48.9	45.1	42.2	40.1	38.9	36.4	34.0	31.0	29.5	25.8	20.5
2003/04	52.1	48.0	43.7	40.0	37.3	35.3	34.1	31.7	29.4	26.5	25.0	21.2	16.3
2004/05	46.6	42.6	38.4	34.9	32.3	30.3	29.2	26.9	24.6	21.8	20.4	16.8	12.1
2005/06	40.8	37.0	33.0	29.6	27.1	25.2	24.1	21.9	19.7	17.0	15.6	12.2	7.6
2006/07	36.2	32.5	28.6	25.3	22.9	21.1	20.0	17.9	15.8	13.2	11.8	8.5	4.1
2007/08	30.8	27.2	23.5	20.4	18.0	16.3	15.3	13.2	11.2	8.7	7.4	4.2	
2008/09	25.5	22.1	18.6	15.5	13.3	11.6	10.6	8.7	6.7	4.3	3.1		
2009/10	21.8	18.4	15.0	12.1	9.9	8.3	7.3	5.4	3.5	1.2			
2010/11	20.3	17.0	13.6	10.7	8.6	7.0	6.0	4.1	2.3				
2011/12	17.6	14.4	11.1	8.3	6.1	4.6	3.6	1.8					
2012/13	15.5	12.4	9.1	6.3	4.3	2.7	1.8						
2013/14	13.5	10.4	7.2	4.5	2.4	0.9							
2014/15	12.5	9.4	6.2	3.5	1.5								
2015/16	10.8	7.8	4.7	2.0									
2016/17	8.6	5.7	2.6										
2017/18	5.9	3.0											
2018/19	2.8												

Figure 1: This table shows Section 148 Orders – revaluation of earnings factors published in the UK statistics monthly update.

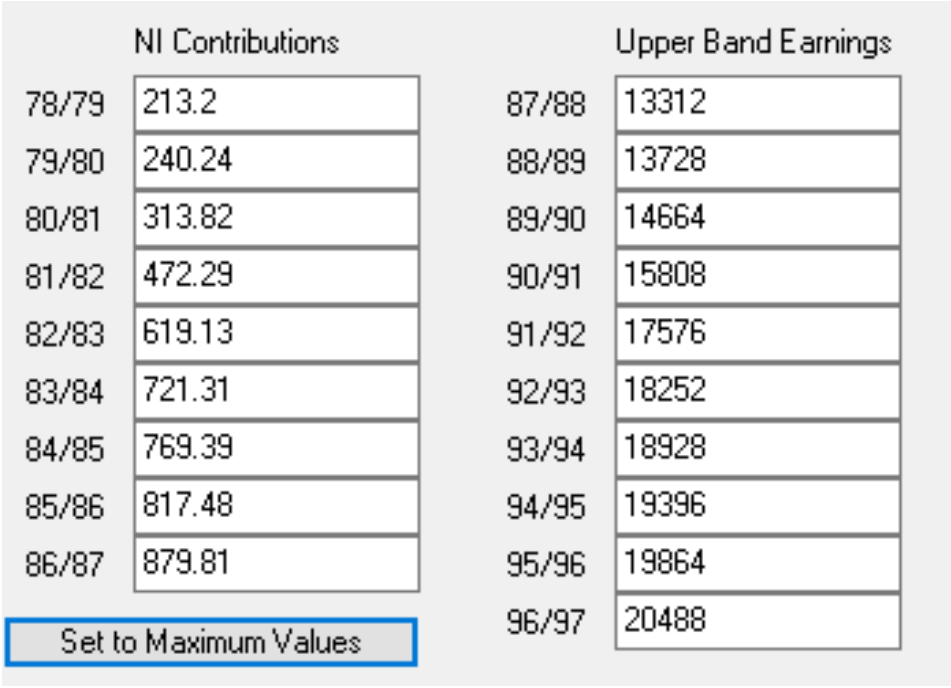

Figure 2: Calculation of the members' earnings for example 1, chapter 3, using the WTW internal software.

Tax Year	Emp'ees c/o Cont Rate
1978/1979	4.00
1979/1980	4.00
1980/1981	4.25
1981/1982	5.25
1982/1983	6.25
1983/1984	6.85
1984/1985	6.85
1985/1986	6.85
1986/1987	6.85
1987/1988	n/a

Figure 3: Employees contribution rate to NIC through the tax years the member has been in service, used for example 1 in chapter 3.