Government Actuary's Department

Ministry of Justice

Personal Injury Discount Rate Analysis

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1 Executive Summary

1.1 As part of the consultation on potential changes to the legal framework by which the Personal Injury Discount Rate ('PI discount rate') is set, the Ministry of Justice ('MoJ') has asked the Government Actuary's Department ('GAD') to analyse outcomes for claimants in receipt of a lump sum award of damages for future financial loss under different illustrative PI discount rates which, based on information gathered during the consultation, reflect the way that claimants invest their award and the way in which they are advised to invest their award by their investment advisers.

1.2 In practice claimant outcomes will depend on a number of factors including the decisions they make and factors that are beyond their control. For example, these factors will include:

- The investment strategy adopted.
- The returns achieved on the portfolio.
- How long the claimant lives for, relative to the term of the award.
- The rate at which the claimant makes withdrawals from the fund to meet their damage needs and how this compares to what was expected at the outset.

1.3 The MoJ have asked for the analysis of claimant outcomes in this report to focus on the investment risks faced by the claimant. We have done this by simulating a representative individual claimant's fund under 1,000 economic scenarios. In particular, we have used simulations of future asset returns and inflation from an Economic Scenario Generator to assess:

- scenarios of the future in which the claimant, in retrospect, was 'over-compensated' in so far as the award proved to be larger than required and the claimant was left with surplus funds at the end of the award period; and
- scenarios of the future in which the claimant, in retrospect, was 'under-compensated' in so far as the award proved to be smaller than required and the claimant had inadequate funds to meet all damages throughout the award period.

In both cases we are not only interested in whether the claimant is over- or under-compensated but also on the level of over-/under-compensation.

1.4 The analysis depends critically on a number of key assumptions:

- **Investment strategy** – The MoJ have calculated two assumed investment strategies that were based on the information provided by investment advisers and wealth managers during the consultation period on the way in which claimants invest their awards and the way in which they are advised to invest their award.

- **Damage profile** – we have only analysed outcomes for a claimant that has to meet damages of £10,000 per annum, linked to the Retail Prices Index ('RPI') for 30 years.
- **PI discount rate award basis** – MoJ asked us to consider outcomes for a number of different PI discount rates that range from RPI-1.75% to RPI+1%.
- **Other risks** – we have ignored other risks and factors, for example mortality and inflation.
- **Economic simulations** – these are based on economic scenarios generated by a proprietary Economic Scenario Generator ('ESG').

1.5 The results of the analysis in this report is limited as we do not consider the sensitivity of the analysis to these assumptions. However, the analysis presented in this report is intended to be illustrative – in particular to demonstrate the wide range of potential claimant outcomes and articulate the risks (and potential benefits) of different award sizes for a given investment strategy. We are satisfied that the assumptions and approach taken provide a reasonable illustration of claimant outcomes and risks faced.

1.6 The analysis shows the potential returns that may be achieved on the assumed portfolios over different award periods:

Table 1 – Expected real returns on claimant portfolios

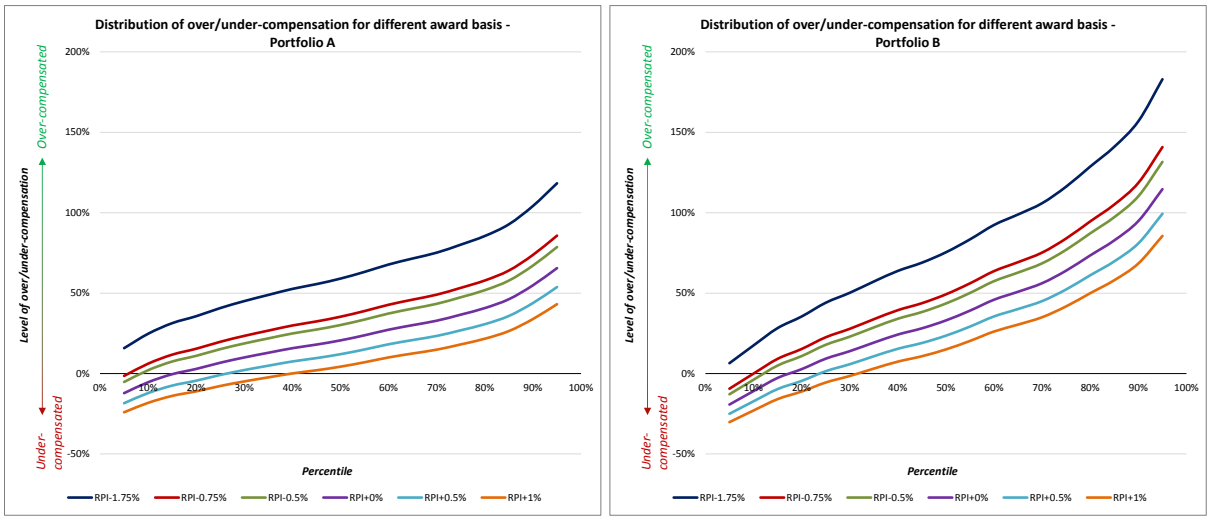
Median money weighted real return %pa	Award period / investment horizon					
	5 years	10 years	15 years	20 years	30 years	50 years
Portfolio A	0.0%	0.6%	1.0%	1.2%	1.3%	1.6%
Portfolio B	0.0%	1.3%	1.7%	1.9%	2.0%	2.3%

Note: returns are in excess of RPI, which over 30 years is projected to be 2.7% pa on average.

1.7 The table demonstrates the importance that the duration of the award is likely to have on claimant outcomes – expected returns over shorter periods are lower, meaning that claimants that adopt a given strategy with shorter awards are more likely to be under-compensated. This feature arises because the distribution of possible future economic scenarios is tilted slightly towards those that follow a "reversion to norm" over time compared to today's low return environment.

1.8 The chart below shows the distribution of over-/under-compensation for the assumed investment strategies (Portfolio A and Portfolio B) under different PI discount rate award bases.

Figure 1 – Distribution of over/under-compensation



1.9 The key messages from this analysis are:

> Under all PI discount rates and both the investment strategies considered, the claimant is over-compensated at the median level (i.e. 50th percentile). This reflects the fact that all PI discount rates considered are lower than the median return on the portfolios over the 30 year period (RPI+1.3% pa and RPI+2.0% pa for Portfolio A and B respectively). Under the current PI discount rate (RPI-0.75%), the median level of over-compensation is 35% assuming that the claimant invests in Portfolio A and 49% assuming that the claimant invests in Portfolio B.

> The investment strategies considered are not 'risk free' – even if the PI discount rate is set lower than the expected return (and hence the claimant is given a larger award than is expected to be needed to meet the damages) then there remains a risk that the claimant is left under-compensated.

> Higher PI discount rates produce smaller awards which lead to:

- Lower 'average' or 'overall' levels of over-compensation. As such, the lowest PI discount rates result in significant levels of over-compensation – such that claimants are over-compensated in the tails of the distribution for the lowest PI discount rates.

- Bigger risks of the claimant being under-compensated. As such, under higher PI discount rates, the tails of the distributions result in significant levels of under-compensation.

1.10 As noted above, the analysis does not consider other risks faced by the claimant – in particular mortality and inflation risk and the risk that damage needs are not as originally expected. If these risks are considered in addition to the investment risk then differences between 'lower' and 'higher' risk portfolios are likely to be reduced (because the different risks are to some extent diversified). As a result, even a very risk averse claimant might be inclined to assume more investment risk as a protection against longevity.

1.11 The projected returns and analysis outlined above ignore investment fees, management charges, adviser fees and taxes that the claimant will be required to meet. If explicit allowance is not included in the PI discount rate for these factors and the rate is set directly with reference to the analysis above then the claimant will be at greater risk of under-compensation.

1.12 The appropriate allowance for expenses and tax is likely to depend on a number of factors and assumptions and will require a degree of judgement. As such further work is likely to be needed to determine the reasonable allowance for expenses and tax. That said, based on an initial high level assessment, we believe that a deduction of around 0.5% pa is likely to be reasonable. Due to the further work required, the current analysis presents the results without adjusting for expenses and tax.

2 Background and Scope

2.1 The Personal Injury Discount Rate ('PIDR' or 'PI discount rate') is used to determine lump sum damage awards to claimants who suffer a serious personal injury.

2.2 In February 2017, the Lord Chancellor changed the PIDR from RPI+2.5% to RPI-0.75%. At the same time, the Lord Chancellor also announced a period of consultation to review whether the current legal framework for setting the rate is fit for purpose or whether changes are necessary.

2.3 As part of this consultation and to inform the impact of potential changes to the law, the Ministry of Justice ('MoJ') has asked GAD to analyse outcomes claimants in receipt of a lump sum award of damages for future financial loss under different PI discount rates which, based on evidence collected during the MoJ consultation, reflect the way that claimants invest their award and the way in which they are advised to invest their award by their investment advisers.

2.4 This report sets out the findings of this analysis. As discussed and agreed with MoJ, the scope of our analysis has been limited in that:

- The analysis presented in this report is intended to be illustrative – in particular to demonstrate the wide range of potential claimant outcomes and to articulate the risks (and potential benefits) of different award sizes for a given investment strategy.
- The analysis only considers two investment strategies, which are broadly derived from consultation with wealth managers and investment advisers during the consultation period. In practice, claimants will invest in a wider range of portfolios and strategies.
- The analysis focuses on the outcomes for an individual claimant with a particular pattern of damages.
- We have only considered a handful of award PI discount rates – all of which assume that damages are inflated with RPI. We have not considered other potential measures of inflation – for example the Consumer Prices Index (CPI) or Annual Survey of Hours and Earnings (ASHE).
- For simplicity, the analysis only considers a single PI discount rate. The analysis presented in this report should not be seen as preventing the setting of more than one rate in the future (e.g. rates which vary by the term of loss of any award).
- The analysis focuses on the investment risks that claimants are exposed to and although we briefly consider others risks and the interaction of multiple risks, the analysis is limited in this regard.
- The analysis is based on the assumptions included and derived from a third-party Asset Liability Model, the ESG. Views on future investment returns are uncertain and subject to a wide degree of judgement and so other views and assumptions are plausible.

- This report provides one possible way of expressing and comparing claimant outcomes. There are many other methods and approaches by which this could be done and the approach expressed in this report should not prevent other approaches being used or considered in the future.
- The analysis presented in this report should not be directly or solely relied upon for the basis of determining the rate, nor does it provide a proposal of how the PI discount rate might be determined in the future.

2.5 In the rest of this report:

- Section 3 outlines the methodology we have adopted in analysing claimant outcomes and introduces the metrics and framework we have derived to quantify these outcomes.
- Section 4 outlines the assumptions we have made about the claimant, the damages they receive and the way in which they invest their award.
- Section 5 outlines the economic and financial assumptions used to analyse claimant outcomes.
- Section 6 outlines the results of our analysis.
- Section 7 provides a brief comment on allowance for expenses and tax in setting the PI discount rate.
- Section 8 provides a brief commentary of the potential sensitivity of the analysis shown and discusses some factors that are likely to have a significant impact on the results which have not been considered here.
- Section 9 outlines some limitations on the reliance of this report and a statement of compliance with professional standards.

3 Methodology and metrics

3.1 Whilst personal injury awards are determined based on the expected damages and are expected to leave the claimant fully compensated, actual claimant outcomes will depend on the decisions made by the claimant and factors that are beyond their control. For example, the table below describes some of the choices and factors that will influence claimant investment outcomes:

Table 2 – Factors influencing claimant investment outcomes

	Factor	Potential impact / description
1	The investment strategy adopted by the claimant – in particular how this compares to the PI discount rate used in determining the award	A claimant taking more (less) risk than is assumed in the PI discount rate would be expected to be over (under) compensated.
2	The returns that are achieved on the portfolio (for the investment strategy adopted)	Investing in a risky investment strategy is not guaranteed to deliver returns and there is the potential that poor returns will leave the claimant under-compensated.
3	How long the claimant lives for – in particular how this compares to the mortality assumptions used in determining the award	A claimant that lives longer (shorter) than expected will be left under-compensated (over-compensated) other things being equal.
4	Damage needs and profile – in particular how this compares to the pattern of damages that is assumed in determining the award	A claimant may need to make earlier or later withdrawals from their fund which may impact on outcomes.
5	The rate of damage inflation – in particular how this compares to the inflation measure assumed in determining the award (RPI for this analysis).	A claimant whose cost of damages increase quicker (slower) than the inflation measure used will be under-compensated (over-compensated).
6	Capacity of loss	A claimant who has more reliance on the award, has limited alternative access to funds or has more severe damages is likely to have smaller capacity of losses and therefore might adopt a more cautious approach.

3.2 Given the number of factors and issues that can affect claimant investment outcomes, analysing and allowing for all of these is likely to be difficult. As such, and given that the investment risk and return trade-off is the most important consideration for determining the PI discount rate, MoJ have asked us to limit our analysis on the second issue above.

3.3 Our analysis does this by consideration of how the claimant's fund might evolve over time under Monte Carlo simulations for future asset returns and inflation. The use of Monte Carlo (or 'stochastic') scenarios allows us to:

- show the wide range of potential outcomes;
- estimate a distribution of outcomes and different percentiles of this distribution; and
- estimate the probability of outcomes being worse or better than a given level.

3.4 Given that our analysis included in this report focuses on the risk of poor returns, the analysis ignores the other risks faced by the claimant (e.g. mortality risk, inflation risk[1] and the risk that funds are required in a different manner than was expected when the award was granted). These risks are likely to have a significant impact on claimant outcomes and more discussion on these risks is included in Section 8.

Outline of calculations

3.5 The analysis projects a representative individual claimant's fund over a defined period over 1,000 economic scenarios. In particular:

- We have used the ESG in a third-party Asset Liability Model to generate 1,000 simulations of future investment returns for a wide range of asset classes. More details on these assumptions are given in Section 5.
- The fund is projected into the future under 1,000 economic scenarios, such that the fund at the end of each year in each economic scenario is determined with regard to:
  - The fund value at the beginning of the year in that scenario;
  - Increased to allow for the simulated returns[2] (in that scenario/year) on the investments held;
  - Reduced for withdrawals made from the fund to meet damages (which are inflated in line with RPI according to the economic scenario).

3.6 In practice the claimant's initial fund value will be determined based on:

- The pattern of damages included in the award; and
- The assumed PI discount rate.

[1] Inflation risk in this sense is defined as the risk of damage inflation not being equal to RPI. The uncertainty inherent in future levels of RPI and the way in which the investments meet (or do not meet) this is included in the analysis because the ESG provides a stochastic projection of RPI.

[2] In this context, returns includes both capital growth and income (e.g. dividends or coupons).

3.7 We have compared this award value given to the claimant against the amount required for the claimant to run out of income exactly at the end of the term of his or her award. If the amount awarded in practice is larger than the amount required then the claimant is described as over-compensated and if the amount is less than required than the claimant is described as under-compensated. This comparison is calculated for each scenario, meaning that a distribution of outcomes is derived.

3.8 This process is perhaps best illustrated by a simplified illustrative example. We assume that the claimant needs to meet damages of £10,000 in the next two years, that we ignore damage inflation for the time being and that the illustrative returns in the next two years for the purpose of this example are as follows:

Table 3 – Illustrative investment returns

Economic Scenario	Returns in year 1	Returns in year 2
1	11%	1%
2	-6%	18%
3	20%	-11%
4	2%	3%
5	-3%	-10%

Note: these scenarios are only illustrative and are not intended to be representative of the projected range of returns.

3.9 Assuming that withdrawals from the fund occur half-way through the year, and investment returns on the fund are achieved uniformly over the year, then we can determine the initial fund value required in each scenario to leave the fund fully exhausted after two years:

Table 4 – Example fund projections

Economic Scenario	Initial Determined Fund Value (£)	Fund value at end of year 1 (£)	Fund value at end of year 2 (£)
1	18,456	9,950	0
2	20,108	9,206	0
3	17,962	10,600	0
4	19,562	9,853	0
5	21,020	10,541	0

3.10 For example, the fund value at the end of year 1 in scenario 1 is determined as:

$$£9{,}950 = £18{,}456*(1.11)-£10{,}000*(1.11)^{½}$$

Note: recall that we are ignoring inflation in this example so damages are assumed to be £10,000. See paragraph 3.13 below.

3.11 The initial fund values in each scenario are compared against the actual award size to determine the level of over or under-compensation.

3.12 For example, if the award PI discount rate is 0% then the claimant would be awarded £20,000 to meet the payments above. This is compared against the initial determined fund value in each scenario to determine the level of over or under-compensation. In the first scenario the claimant would be over-compensated by 8.4%.

Table 5 – Example of over-/under-compensation determination

Economic Scenario	Initial Determined Fund Value (£)	Initial Fund value under award basis of 0%	Over / under-compensation
1	18,456	20,000	8.4%
2	20,108	20,000	-0.5%
3	17,962	20,000	11.3%
4	19,562	20,000	2.2%
5	21,020	20,000	-4.9%

3.13 Whilst this example ignores the inflation indexation that is applied to the damages, the principle is the same if inflation is included in the calculations and we have assumed that the damages are linked to RPI in our analysis.

3.14 These calculations result in a distribution of claimant outcomes which can be used to assess the extent of any 'extreme' or 'poor' outcomes or to assess the probability of outcomes being worse than a specified level.

3.15 In our analysis and when comparing different PI discount rates, we have focused on:

- The median level of under/over-compensation at different percentiles – we believe that the median provides the best measure of the 'average' scenario or outcome as means can be distorted by distributions with long tails.
- The lower tails of the distribution, in particular the 5th and 10th percentiles – to give an indication of the tail risks faced by claimants.
- The upper tails of the distribution, in particular the 90th and 95th percentiles – to give an indication of the potential upside claimants might receive.
- The probability of claimants being under-compensated by 5% or more and 10% or more[3] – to give a feel for how much 'weight' is in the lower tail.
- The probability of claimants being over-compensated by 5% or more and 10% or more – to give a feel for how much 'weight' is in the upper tail.

3.16 These metrics are only chosen to be illustrative and in particular to demonstrate the different parts of the distribution. We don't have a view on which measure should be focused on to inform policy decisions and other measures and metrics are possible and may be better at informing or framing policy decisions.

[3] Note that references in this report of a claimant being under-compensated often describe the claimant as being "*under-compensated by x% or more*". In this description, we have removed the negative sign from the level of compensation and 'more' is taken to describe a more extreme negative outcome. As such, "*under-compensated by 5% or more*" is equivalent to "*over-compensated by -5% or less*" and both can be taken to describe the left hand tail of the distribution.

4 Assumptions: damage profile and investment strategy

4.1 This section outlines the assumptions we have made with regard to the claimant's pattern of damages and the investment strategy they adopt. The assumptions made in this section are likely to have a significant impact on the outcomes of the analysis. However, as agreed with MoJ we have limited our analysis to a single individual claimant.

Damage profile

4.2 In carrying out the analysis we assume that a claimant has to meet damages of £10,000 per annum, linked to RPI for an assumed period of 30 years. We do not include mortality risk and so ignore the possibility of the claimant dying before the end of the 30 year period or surviving beyond the 30 years. We also ignore the possibility that damage inflation does not perfectly match RPI or that the claimant needs to draw down from the fund in a different pattern to 30 regular payments of £10,000.

4.3 In practice this approach is a significant simplification of the claimant's position – for example the award is likely to be based on a 'rest of life' basis. However this approach allows us to isolate the impact of investment risk on claimant outcomes.

4.4 One of the key assumptions made with regards to the damage profile is the length of time over which damages are applicable. This is because return expectations are different over different time periods – for example return expectations over the short term might (as now) be lower than return expectations over the longer term. As a result of this, claimants currently with shorter award periods will typically achieve lower investment returns than claimants with longer award periods.

4.5 This means that the claimant outcomes considered in this report are likely to be highly sensitive to the length of the award and the 30 year award period presented is intended to be illustrative rather than representative. That said 30 years can broadly be considered as somewhere between "short" awards (for example given to those with severe injuries, lower life expectancy or older claimants) and "long" awards (for example given to younger claimants). The award is also broadly consistent with "loss of earnings" damages awarded to a claimant in their mid-late 30s (as included in the consultation document).

Investment strategies

4.6 During the consultation period, MoJ consulted with wealth managers and investment advisers on the way in which claimants invest their awards and the way in which they are advised to invest their award. Based on this information, MoJ has provided GAD with two assumed investment strategies to be used for the basis of our analysis.

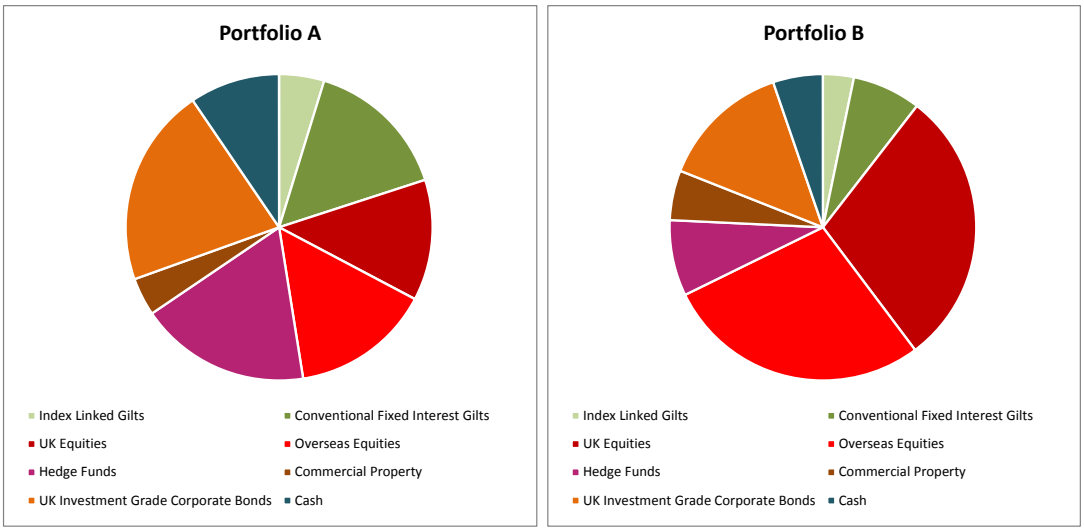
4.7 Our understanding is that the advisers gave a range of strategies to reflect potential different risk preferences amongst claimants. MoJ grouped these recommendations by risk tolerance and have provided us with an 'average' or 'representative' investment strategy for two portfolios:

> Portfolio A – this is an average or typical portfolio invested in by personal injury claimants, based on evidence from wealth managers and investment advisers of what claimants do and are advised to do, which corresponds most closely with a "low risk" investment strategy for personal injury claimants; and

> Portfolio B – this is an average or typical portfolio invested in by personal injury claimants, based on evidence from wealth managers and investment advisers of what claimants do and are advised to do, which corresponds to claimants who were described as taking more risk than claimants adopting Portfolio A. It is based on MoJ's interpretation as being representative of the highest risk investment strategy that wealth managers and investment advisers would recommend or have recommended to personal injury claimants.

4.8 The assumed investment strategies included in our analysis are shown below:

Figure 2 – Assumed Investment Strategies



4.9 More details on the investment strategies is shown in Annex A.

4.10 We have not independently verified the strategies above from the consultation responses. However during discussions with MoJ we have commented on the assumptions made by them in deriving these strategies and we are satisfied with the approach and assumptions in deriving these strategies.

4.11 However, we would stress that the strategies shown and analysed in this report are just two possible strategies and that there is no universally accepted definition of, say, a 'low risk investor' or a 'low risk investment strategy'. That said, we are satisfied that the strategies shown provide a reasonable range of the strategies advised to claimants and as this analysis is only intended to be illustrative, we think it is appropriate for demonstrating the potential range of outcomes.

4.12 The portfolios included in the analysis are based on the information provided by wealth managers and investment advisers. As such the portfolios may not be 'optimal' in that the strategies may not optimise the metrics considered (i.e. the portfolios may not deliver the best average outcome for a given level of tail risk). However again, given that the analysis is intended to be illustrative and the analysis is not being used to advice on claimant strategies we believe that the approach is appropriate.

4.13 The investment strategies included in the modelling is assumed to be 'static' in that the claimant is assumed to rebalance the portfolio each year to maintain the allocations above[4]. In practice claimants are likely to change their strategy over time – for example reduce levels of risk to 'bank' periods of good returns, increase levels of risk to recover from periods of poor returns or to reduce the level of risk as the remaining period of the award reduces. Whilst it is possible to model these features within the analysis we have not done so to keep the analysis as simple as possible – as such the range of outcomes shown is likely to be wider than that which claimants might achieve should they adopt these approaches.

PI discount rates

4.14 MoJ asked us to compare claimant outcomes on the investment strategies above, assuming that the award is determined using the following PI discount rates:

Table 6 – Assumed PI discount rates

Discount Rate	Description
RPI-1.75%	As an indication of what possible outcomes might be in the next 2 to 3 years if no change is made to the law, gilt yields remain at current levels, and the rate is set again by reference to a three year average of index-linked gilt yields.
RPI-0.75%	To illustrate outcomes under the current PI discount rate.
RPI-0.5%	To give an indication of the range of possible outcomes, assuming that the PI discount rate is set with more regard to the expected return on the way in which claimants might invest their fund.
RPI+0%	
RPI+0.5%	
RPI+1%	

4.15 In determining the award, uninflated (i.e. real) damages are discounted at the real PI discount rates given in the table above. In each future projected scenario, damages are inflated by the simulated RPI series, which over 30 years is projected to be 2.7% pa on average.

[4] Apart from the index-linked gilt portfolio, which is assumed to rebalance between index-linked gilts of different maturities to provide a better match to the damage profile – see section 5 and Appendix B for more details.

5 Assumptions: economic scenarios

5.1 The economic scenarios used in this analysis are generated from the ESG in a proprietary third-party Asset Liability Model. We have generated 1,000 simulations of future investment returns starting from, and based on market conditions as at 31 December 2016.

5.2 The ESG methodology used to generate the simulations is similar to other standard approaches and the scenarios include a wide range of plausible outcomes (for example 'booms' and 'crashes') and is calibrated to historical data. The simulated return paths for each asset class reflect the characteristics, riskiness and expected return of the asset class. Simulated returns for different asset classes also reflect the assumed correlation between the asset classes.

5.3 The calibration of the economic scenarios – including views on expected returns, inflation and correlations – is provided by our third party Asset Liability Model provider as at 31 December 2016. We believe that the assumptions are within a range that could be considered reasonable, are still broadly reflective of current market conditions and are appropriate for use in illustrating potential claimant outcomes. However, alternative views that cover both higher and lower simulations of returns and inflation do exist.

Inflation

5.4 The table below shows the median level of RPI inflation which was used to inflate damages in this analysis. The table shows that inflation expectations are not flat – with lower levels of projected inflation in the shorter term.

Table 7 – Median RPI simulations

Rate of inflation over the period[5] %pa	5 years	10 years	15 years	20 years	30 years	50 years
RPI	2.2%	2.2%	2.4%	2.6%	**2.7%**	2.9%

Source: Economic Scenario Generator

5.5 Note that because all of the calculations are done in real terms, the assumed level of inflation does not directly influence the results of the analysis and it is the real returns (i.e. level of return in excess of RPI) which ultimately drives the results of the analysis.

[5] Note that the table records the rate of RPI over the period shown and not the rate of RPI inflation in the year shown. In other words, the 2.9% rate of inflation shown over 50 years will include RPI of 2.2% in the first 5-10 years and hence include higher RPI in the later years.

Real returns on investment

5.6 Making regular withdrawals from a fund can have a significant impact on the effective returns achieved – for example, making a significant withdrawal from the fund following an early fall in asset values will hinder an investment manager's ability to recover the fund in subsequent periods[6]. This feature is a significant risk for the assumed claimant included in this analysis as we are assuming that they have to finance 30 regular withdrawals from the fund.

5.7 As such, references to projected returns in this report allow for the specified assumed withdrawals from the fund and the table below shows the median annualised effective real return achieved on each asset class. These returns are real (in excess of RPI) and essentially assume that regular withdrawals are made from a fund that is solely invested in a representative broad index for each asset class.

Table 8 – Median asset class return simulations

Median money weighted real return %pa	5 years	10 years	15 years	20 years	30 years	50 years
Index-Linked Gilts[7]	-2.2%	-2.8%	-2.6%	-2.3%	**-1.8%**	-1.1%
Conventional fixed-interest Gilts	-1.3%	-1.5%	-1.4%	-1.2%	**-0.9%**	-0.3%
UK Equities	-1.3%	0.7%	1.3%	1.8%	**2.0%**	2.2%
Overseas Equities	0.3%	2.2%	2.7%	2.7%	**2.7%**	2.6%
UK Investment Grade Corporate Bonds	-0.2%	-0.1%	0.1%	0.2%	**0.4%**	0.9%
Cash	-2.1%	-1.5%	-1.3%	-1.2%	**-0.9%**	-0.5%
Commercial Property Funds	-1.9%	0.2%	1.2%	1.7%	**2.1%**	2.4%
Hedge Funds[8]	0.3%	1.0%	1.1%	1.1%	**1.0%**	0.9%

Source: Economic Scenario Generator
Note: returns are in excess of RPI

5.8 For example, if the entire fund were invested in UK equities and used to provide regular RPI-linked damages over a 30 year period then the median effective real return is RPI+2.0%. Or equivalently, a PI discount rate of RPI+2.0% with an assumed investment strategy of 100% UK equities would result in the median level of over/under-compensation of 0%[9].

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[6] In technical terms – this is essentially the difference between Time-Weighted Rates of Return (which ignore withdrawals from the fund) and Money-Weighted Rates of Return (which are affected by withdrawals and additions to the fund).

[7] See Appendix B for further details on the assumptions made in modelling the index-linked gilt portfolio

[8] Hedge funds are an investment fund that invest in a variety of assets and sub-pools and are constructed to take advantage of certain identifiable market opportunities. There is a wide range of different types of hedge fund available. Hedge Funds are used as a proxy for investments in 'alternative asset classes' – see Appendix A for further details.

[9] Ignoring other risks and ignoring any allowance for expenses and tax.

5.9 The table shows that:

- Higher risk assets, such as equities and property have higher expected returns.
- Returns over shorter periods are typically smaller than returns over longer periods. This feature arises because the distribution of possible future economic scenarios is tilted slightly towards those that follow a "reversion to norm" over time compared to today's low return environment.

5.10 Although not shown in the table, assets with higher returns also have higher risk. As a result, although an investor would expect to benefit from investing in an asset with a higher expected return they are also increasing the probability of experiencing poor returns and hence incurring poor outcomes.

Index-linked gilts

5.11 Currently, the PI discount rate is set with reference to returns on index-linked gilts (or 'ILGs') on the grounds that this type of investment represented virtually 'risk-free' investment, specifically designed to keep pace with inflation. We would note that in practice, the 'risk free' portfolio is likely to be only a theoretical construct and even a portfolio invested in 100% ILGs would not lead to 'risk free' claimant outcomes.

5.12 In particular, the claimant would face the following challenges from adopting such an approach:

- the fact that the claimant cannot be 100% certain of their damage pattern and the rate of damage inflation;
- even if we ignore this feature, there is not a 'full curve' of index-linked gilts – i.e. it is not the case that there is an index-linked gilt that redeems in each year in the future; and
- using index-linked bonds to hedge or reduce investment risks requires considered selection of which gilts (or gilt funds) to invest in – an investment in index-linked gilts of the wrong maturity can leave the claimant exposed to significant investment risks.

5.13 As a result, we have made further assumptions on the way in which claimants make investments in index-linked gilts in order to manage the risks associated with investing in index-linked gilts which are outlined in Appendix B.

Other considerations

5.14 The table below shows the median annualised effective real return on the assumed portfolios over different award periods. The table highlights the difference in returns over different periods – with higher returns expected over longer time periods

Table 9 – Median assumed portfolio return simulations

Median money weighted real return %pa	Award period / investment horizon					
	5 years	10 years	15 years	20 years	30 years	50 years
Portfolio A	0.0%	0.6%	1.0%	1.2%	**1.3%**	1.6%
Portfolio B	0.0%	1.3%	1.7%	1.9%	**2.0%**	2.3%

Note: returns are in excess of RPI

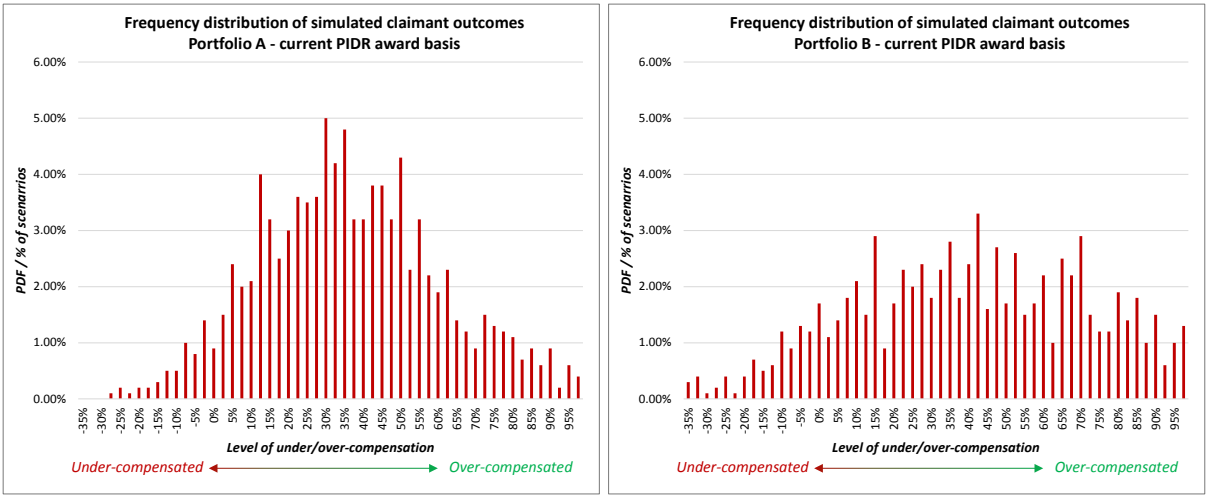
5.15 It should be noted that returns shown above are gross of investment fees, management charges, adviser fees and taxes. As a result, we would recommend that it is appropriate to make suitable adjustment to the PI discount rate for such factors. This is discussed in further detail in Section 7 below.

6 Results

6.1 After carrying out the calculations set out in previous sections, we are left with 1,000 simulations of claimant outcomes.

6.2 For example, the chart below shows frequency distribution of simulated claimant outcomes, assuming that the claimant invests in the two assumed portfolios outlined in Section 4 and that the lump sum award is determined using the current PI discount rate (RPI-0.75%).

Figure 3 – Frequency distribution of simulated claimant outcomes

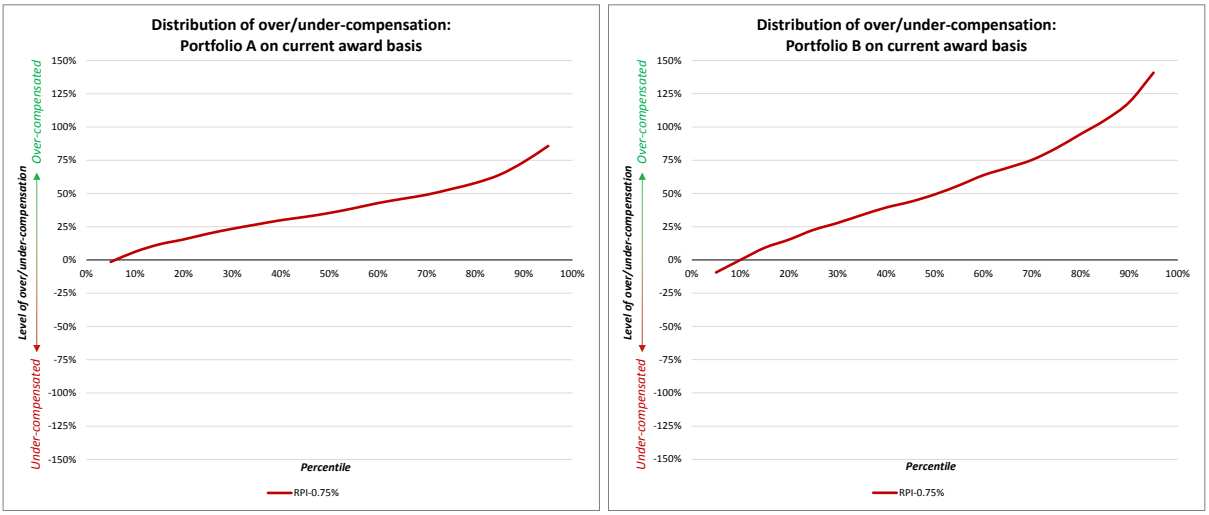


Note: that a positive figure represents a scenario in which the claimant is over-compensated, whilst a negative figure represents a scenario in which the claimant is under-compensated

6.3 Given that the expected return on the investment strategies (RPI+1.3% pa over 30 years for Portfolio A and RPI+2.0% pa over 30 years for Portfolio B) exceeds the current PI discount rate (RPI-0.75%) then most of the distribution is above zero and 'on average' we expect claimants to be over-compensated. However the left hand tail of the distribution shows that there are a few scenarios in which the actual returns are lower than expected and lower than is assumed in determining the award and so the claimant is accordingly left under-compensated.

6.4 This distribution can also be shown as in the chart below – which shows the level of over/under-compensation (on the y-axis) at different percentiles of the distribution (on the x-axis):

Figure 4 – Distribution of over/under-compensation for assumed portfolios



6.5 Analysing the charts and distributions above, under the current PI discount rate:

> The median level (i.e. the 50th percentile) of over-compensation is 35% if the claimant invests in Portfolio A. The corresponding figure for a claimant investing in Portfolio B is over-compensation of 49%.

Considering the percentiles of the distribution:

> There is a 10% probability of the claimant being over-compensated by 6% or less[10] if the claimant invests in Portfolio A (i.e. the 10th percentile). The corresponding figure for a claimant investing in Portfolio B is over-compensation of 0% or less[10].

> There is a 5% probability of the claimant being under-compensated by 1% or more[11] if the claimant invests in Portfolio A (i.e. the 5th percentile). The corresponding figure for a claimant investing in Portfolio B is under-compensation of 9% or more[11].

> There is a 10% probability of the claimant being over-compensated by 74% or more if the claimant invests in Portfolio A (the 90th percentile). The corresponding figure for a claimant investing in Portfolio B is over-compensation of 119% or more.

[10] Note that at the 10th percentile, the claimant is projected to have a small level of over-compensation, but that outcomes to the left of this in the distribution will leave the claimant under-compensated.

[11] See footnote 3

> There is a 5% probability of the claimant being over-compensated by 86% or more if the claimant invests in Portfolio A (the 95th percentile). The corresponding figure for a claimant investing in Portfolio B is over-compensation of 141% or more.

Considering the probability of over-/under-compensation exceeding certain thresholds:

> There is a 4% probability of the claimant being under-compensated by 5% or more[12] if the claimant invests in Portfolio A. The corresponding probability for a claimant investing in Portfolio B is 7%.

> There is a 2% probability of the claimant being under-compensated by 10% or more[13] if the claimant invests in Portfolio A. The corresponding probability for a claimant investing in Portfolio B is 5%.

> There is a 91% probability of the claimant being over-compensated by 5% or more if the claimant invests in Portfolio A. The corresponding probability for a claimant investing in Portfolio B is 88%.

> There is a 87% probability of the claimant being over-compensated by 10% or more if the claimant invests in Portfolio A. The corresponding probability for a claimant investing in Portfolio B is 84%.

[12] See footnote 3
[13] See footnote 3

6.6 The table below shows the level of over/under-compensation at different percentiles of the distribution for the different award basis and investment portfolios considered.

Table 10 – Percentile distribution of over/under-compensation

	Award basis	Percentile of over/under-compensation for a claimant with a 30 year award																		
		5th	10th	15th	20th	25th	30th	35th	40th	45th	50th	55th	60th	65th	70th	75th	80th	85th	90th	95th
Portfolio A	RPI-1.75%	16%	25%	31%	36%	41%	45%	49%	53%	56%	59%	63%	68%	72%	75%	80%	86%	93%	104%	118%
	RPI-0.75%	-1%	6%	12%	15%	20%	23%	27%	30%	32%	35%	39%	43%	46%	49%	53%	58%	64%	74%	86%
	RPI-0.5%	-5%	2%	7%	11%	15%	19%	22%	25%	27%	30%	34%	37%	40%	43%	47%	52%	58%	67%	79%
	RPI+0%	-12%	-5%	0%	3%	7%	10%	13%	16%	18%	21%	24%	27%	30%	33%	37%	41%	46%	55%	66%
	RPI+0.5%	-18%	-12%	-7%	-4%	-1%	2%	5%	8%	10%	12%	15%	18%	21%	23%	27%	31%	36%	44%	54%
	RPI+1%	-24%	-18%	-14%	-11%	-8%	-5%	-2%	0%	2%	4%	7%	10%	12%	15%	18%	22%	26%	34%	43%
Portfolio B	RPI-1.75%	6%	17%	28%	35%	44%	50%	57%	64%	69%	75%	83%	92%	99%	106%	116%	129%	141%	157%	183%
	RPI-0.75%	-9%	0%	9%	15%	23%	28%	34%	39%	44%	49%	56%	64%	69%	75%	84%	95%	105%	119%	141%
	RPI-0.5%	-13%	-4%	5%	11%	18%	23%	29%	34%	38%	44%	50%	57%	63%	69%	77%	87%	97%	110%	132%
	RPI+0%	-19%	-11%	-3%	3%	9%	14%	19%	24%	28%	33%	39%	46%	51%	56%	64%	73%	83%	95%	115%
	RPI+0.5%	-25%	-17%	-10%	-5%	1%	6%	11%	15%	19%	24%	29%	36%	40%	45%	52%	61%	70%	81%	99%
	RPI+1%	-30%	-23%	-16%	-11%	-6%	-2%	3%	7%	11%	15%	20%	26%	30%	35%	42%	50%	58%	68%	86%

6.7 The main points to note are:

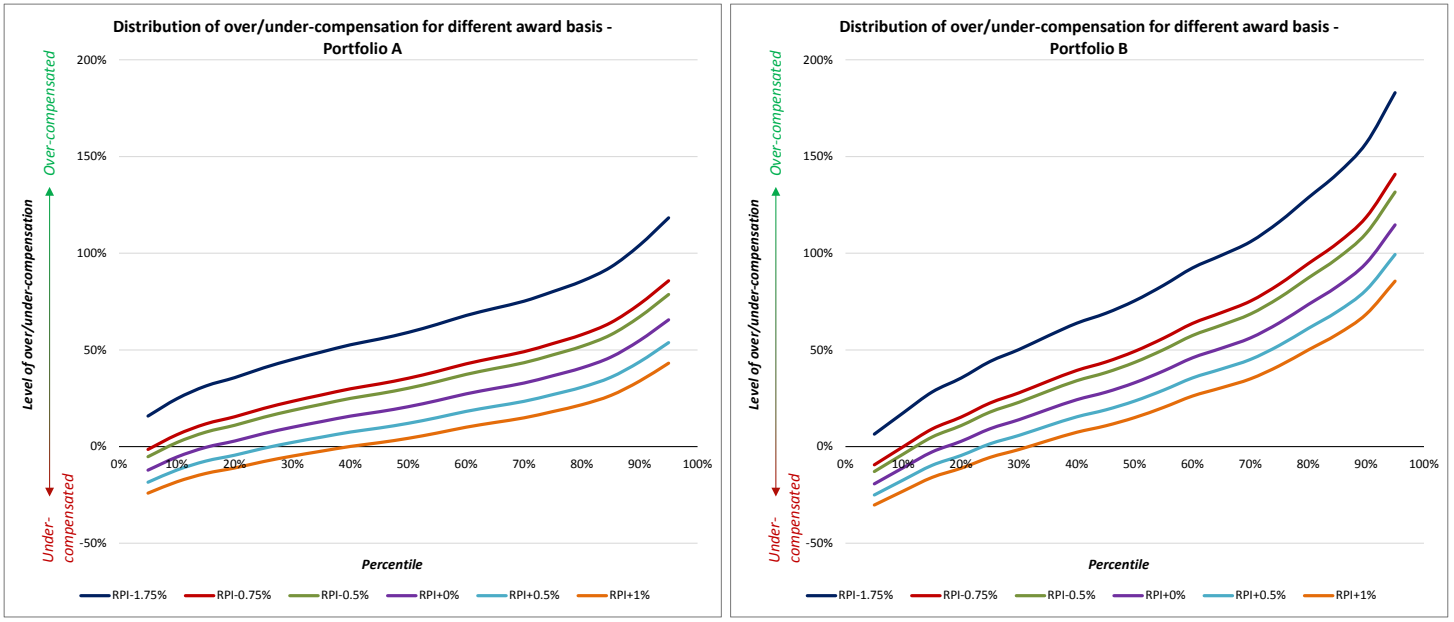
> Under all PI discount rates and both investment strategies considered, the claimant is over-compensated at the median level (i.e. 50th percentile). This reflects the fact that all PI discount rates considered are lower than the median return on the portfolio over the 30 year period (RPI+1.3% pa and RPI+2.0% pa for Portfolio A and B respectively).

> The investment strategies considered are not 'risk free' – even if the PI discount rate is set lower than the expected return (and hence the claimant is given a larger award than is expected to be needed to meet the damages) then there remains a risk that the claimant is left under-compensated.

- Whilst a 'riskier' investment strategy delivers a higher expected (i.e. median) level of over-compensation and better outcomes in the upper tails, it comes with more risk on the downside – in that the lower tails have more extreme/severe levels of under-compensation.
- Higher PI discount rates produce smaller awards which lead to:
  - A lower 'average' or 'overall' level of over-compensation.
  - A bigger risk of the claimant being under-compensated.
  - More significant levels of under-compensation at the tails of the distributions under higher PI discount rates.
- Equally, lower PI discount rates produce larger awards which lead to:
  - A higher 'average' or 'overall' level of over-compensation.
  - A lower risk of the claimant being under-compensated.
  - Significant levels of over-compensation particularly in the tails of the distribution for the lowest PI discount rates.

6.8 The chart below shows a graphical representation of the results given in the table above – note that the extreme scenarios (i.e. below the 5th percentile and above the 95th percentile) are not plotted.

Figure 5 – Distribution of over/under-compensation for assumed portfolios on different award basis



6.9 Finally, the table below shows selected parts of the distribution and the probability of the claimant being:

> under-compensated by 5% or more and 10% or more; and

> over-compensated by 5% or more and 10% or more.

Table 11 – Summary of results

	Award basis	Median	Probability of being under-compensated by…		Probability of being over-compensated by…		Tail percentile (lower)		Tail percentile (upper)	
			…5% or more[14]	…10% or more[14]	…5% or more	…10% or more	5th	10th	90th	95th
Portfolio A	RPI-1.75%	59%	1%	0%	98%	97%	16%	25%	104%	118%
	RPI-0.75%	35%	4%	2%	91%	87%	-1%	6%	74%	86%
	RPI-0.5%	30%	5%	3%	88%	81%	-5%	2%	67%	79%
	RPI+0%	21%	11%	6%	77%	70%	-12%	-5%	55%	66%
	RPI+0.5%	12%	19%	12%	65%	55%	-18%	-12%	44%	54%
	RPI+1%	4%	30%	22%	48%	40%	-24%	-18%	34%	43%
Portfolio B	RPI-1.75%	75%	2%	2%	95%	94%	6%	17%	157%	183%
	RPI-0.75%	49%	7%	5%	88%	84%	-9%	0%	119%	141%
	RPI-0.5%	44%	9%	6%	85%	81%	-13%	-4%	110%	132%
	RPI+0%	33%	13%	11%	78%	74%	-19%	-11%	95%	115%
	RPI+0.5%	24%	20%	15%	71%	66%	-25%	-17%	81%	99%
	RPI+1%	15%	26%	21%	63%	56%	-30%	-23%	68%	86%

[14] See footnote 3

7 Expenses and tax

7.1 As outlined earlier, the projected returns from the ESG are gross of investment fees, management charges, adviser fees and taxes. Since an investor will have to meet such deductions, the actual returns achieved by the investor will be less than indicated in section 5 and if allowance for these factors is not included in the PI discount rate for these factors then the claimant will tend to be under-compensated by comparison.

7.2 Alternative analysis that includes suitable allowance for expenses and tax will result in different levels of under- and over-compensation to those outlined in the previous section. However we believe that the analysis provides a reasonable representation of the spread of outcomes and that outcomes that include a suitable allowance for expenses and tax can be deduced from the range of results presented on different PI discount rates.

7.3 The appropriate allowance for expenses and tax is likely to depend on a number of factors and assumptions and will require a degree of judgement. As such further work is likely to be needed to determine the reasonable allowance for expenses and tax. That said, based on an initial high level assessment, we believe that a deduction of around 0.5% is likely to be reasonable.

8 Sensitivities

8.1 The results presented in section 6 are highly sensitive to a number of key assumptions. In particular:

Table 12 – Sensitivity of analysis

Assumption	Potential impact / description
Economic assumptions	The analysis has been calculated on one set of economic simulations, calibrated at 31 December 2016. Alternative views on returns and correlations or a calibration based on a different date will result in different simulations for asset returns and inflation and will impact on project outcomes.
Investment strategy	The analysis has been calculated for two given investment strategies. In practice, claimants are likely to adopt a wide range of investment strategies.
Length of award	We have only considered a fixed 30 year award. Claimants with different award periods will have different levels of over/under-compensation because: > The impact of compounding means that any difference between the PI discount rate and the rate of return achieved on investments will be larger for claimants with longer awards. > The rates of return over different periods vary in the economic simulations – claimants with shorter (longer) awards would be relatively under-compensated (over-compensated) since expected returns are lower (higher) over the period of the award.
Mortality risk	We have ignored the mortality risk faced by the investor. The interaction of the different risk factors is likely to have a significant impact on claimant outcomes. For example, even if the claimant invested in a replicating investment strategy that perfectly hedged investment risk then the remaining mortality risk would mean that there is a 50/50 chance that they would be live longer than expected and therefore under-compensated. As a result, even a very risk averse claimant might be inclined to assume more investment risk as a protection against longevity.
Inflation risk	We have assumed that damages are exactly linked to RPI whereas in practice damage inflation will not exactly match the index. As with mortality, the additional risk is likely to impact outcomes.

8.2 Even in the absence of carrying out further sensitivity analysis we can therefore add the following key conclusions to those outlined in section 6:

> The exact levels of under/over-compensation will be sensitive to the economic assumptions – in particular expected returns and correlations between asset classes.

> Claimant outcomes are likely to be highly dependent on the term of the award.

> In practice, the claimant is exposed to other risks (mortality and inflation). If these risks are considered in addition to the investment risk then differences between 'lower' and 'higher' risk portfolios are likely to be reduced (because the different risks are to some extent diversified).

9 Limitations and professional compliance

9.1 The analysis outlined in this report has been carried out in accordance with the applicable Technical Actuarial Standard: TAS 100 issued by the Financial Reporting Council (FRC). The FRC sets technical standards for actuarial work in the UK.

9.2 This report has been prepared for the use of MoJ and must not be reproduced, distributed or communicated in whole or in part to any other person without GAD's prior written permission.

9.3 Other than MoJ, no person or third party is entitled to place any reliance on the contents of this report, except to any extent explicitly stated herein, and GAD has no liability to any person or third party for any act or omission, taken either in whole or part on the basis of this report.

9.4 This report must be considered in its entirety, as individual sections, if considered in isolation, may be misleading, and conclusions reached by review of some sections on their own may be incorrect.

Andrew Jinks

Fellow of the Institute of Actuaries

Stephen Humphrey

Fellow of the Institute of Actuaries

Appendix A: Assumed Investment Strategy

A.1 During the consultation period, MoJ received information from wealth managers and investment advisers on the way in which claimants invest their awards and the way in which they are advised to invest their award.

A.2 Our understanding is that the advisers gave a range of strategies to reflect potential different risk preferences amongst claimants. MoJ grouped these recommendations by risk tolerance and have provided us with an 'average' or 'representative' for two portfolios:

- Portfolio A – this is an average or typical portfolio invested in by personal injury claimants, based on evidence from wealth managers and investment advisers of what claimants do and are advised to do, which corresponds most closely with a "low risk" investment strategy for personal injury claimants; and
- Portfolio B – this is an average or typical portfolio invested in by personal injury claimants, based on evidence from wealth managers and investment advisers of what claimants do and are advised to do, which corresponds to claimants who were described as taking more risk than claimants adopting Portfolio A. It is based on MoJ's interpretation as being representative of the highest risk investment strategy that wealth managers and investment advisers would recommend or have recommended to personal injury claimants.

A.3 In deriving these strategies, a number of assumptions and judgements were required. For example:

- Some of the information provided by the advisers is unclear on the exact type of investment. For example:
  - It is not clear as to whether 'Fixed Income' refers to conventional fixed interest gilts or corporate bonds. Assumptions have been made that allocate positions between appropriate asset classes.
  - Allocations to corporate bonds are assumed to be made to investment grade corporate bonds.
- In an attempt to keep the modelling simple, we did not generate returns for all possible asset classes. Instead we decided to make some assumptions on reasonable approximations – for example:
  - Overseas government bonds are modelled as UK gilts.
  - High Yield bonds are assumed to be modelled as a 50% allocation to overseas equity and a 50% allocation to investment grade credit.
  - All 'alternative' investments (such as 'commodities', 'alternatives' and 'other') are modelled as a 'Fund of Fund Hedge Funds' within the ESG.
  - Investment in infrastructure is modelled as property

A.4 During discussions with MoJ we have commentated on the assumptions and judgements made in deriving these strategies and we are satisfied that they provide a reasonable approach to deriving the investment strategy. Whilst alternative assumptions might be possible and may provide a more 'accurate' projection of claimant outcomes, we are satisfied that the approach taken provides a reasonable illustration of claimant outcomes.

A.5 The table below shows the representative strategy derived following this process.

Table 13 – Assumed investment portfolios

Asset class	Portfolio A	Portfolio B
UK Equities	13%	29%
Overseas Equities	15%	28%
Fixed Interest Gilts	15%	7%
Index-linked gilts	5%	3%
Corporate Bonds	21%	14%
Cash	10%	5%
Property	4%	5%
Alternatives (modelled as Hedge Funds)	18%	8%
Total	**100%**	**100%**

Source: MoJ, GAD – may not sum to 100% due to rounding

A.6 Note that we have not independently verified the strategy above from the information received.

Appendix B: Modelling Index-Linked Gilt Positions

B.1 When simulating investment returns on index-linked gilts, it is important to be clear on what assumptions are made on the way in which the investor constructs the index-linked portfolio. This is because there are wide range of index-linked gilts in issuance, each with different dates of maturity.

B.2 When interest rates rise (in particular gilt yields), there is a reduction in the capital value of the index-linked gilts which may result in negative investment return for an individual holding those gilts. This impact is more severe for index-linked gilts with longer periods to maturity.

B.3 As a result of this feature, the 'return' (i.e. the coupon plus any change in capital value) on different gilts will vary significantly for gilts of different maturity. This can lead to a wide range of possible returns on index-linked gilts and a significant risk for an investor who does not construct their index-linked gilt portfolio in a considered way.

B.4 For an individual investor such as personal injury claimant, investors might gain access to index-linked gilts through investment in a broad ILG fund which invests in a representative broad range of all index-linked gilts in issuance. Whilst this allows easy access for investors, it can mean that the investor is exposing themselves to the investment risks described above.

B.5 However, an index-linked gilt portfolio can be constructed in a more considered way to hedge or 'match' damages and an investor who uses gilts in this way, manages and reduces the risks posed by rising interest rates. This is because index-linked gilts of different maturities can be bought such that the redemptions on the gilts broadly match the damages that are due. Under this approach, any changes in the capital values of the portfolio do not concern the investor – for instance whilst the long dated gilts held may reduce in value, they are still expected to redeem an amount required to meet a need in the future.

B.6 In our modelling, we have assumed that the claimant adopts a more considered approach to constructing their index-linked gilt portfolio that is intended to broadly follow this approach. We assume that the claimant alters their allocation to 'short', 'medium' and 'long' dated index-linked gilts in accordance with the remaining profile of damages. Initially, a mix of short, medium and long dated gilts are purchased, whilst at the end of the projection period, the claimant only remains invested in short dated gilts.

B.7 In particular, the ESG produces investment returns on three gilt funds:

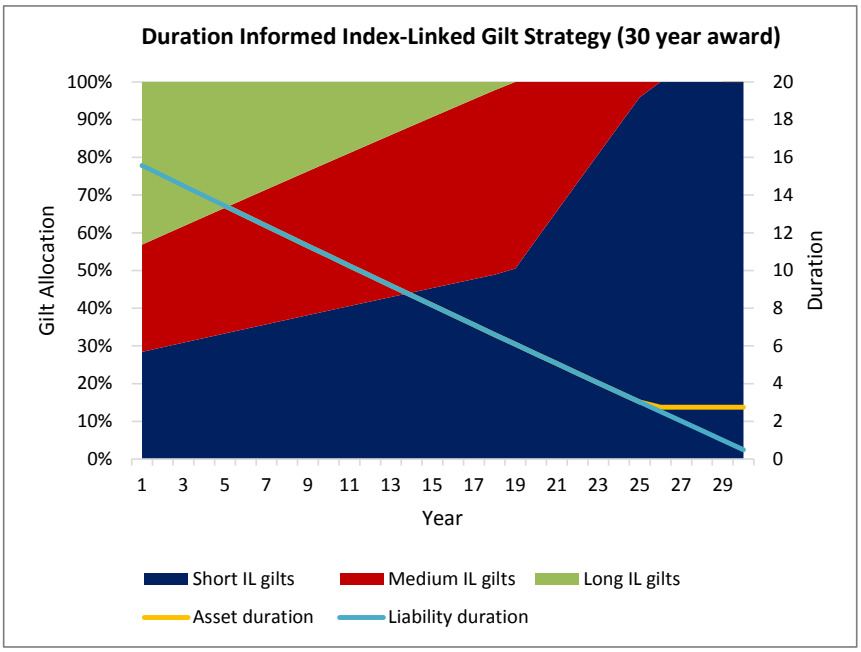
> A short dated index-linked gilt fund that is intended to broadly represent the FTSE Actuaries UK Index-Linked Gilts up to 5 Years Index.

> A medium dated index-linked gilt fund that is intended to broadly represent the FTSE Actuaries UK Index-Linked Gilts 5-15 Years Index.

> A long dated index-linked gilt fund that is intended to broadly represent the FTSE Actuaries UK Index-Linked Gilts over 15 Years Index.

B.8 Allocations to these three funds are assumed to alter over the period of the award – with allocations determined such that the duration of holdings in the three index-linked gilt funds is equivalent to the remaining duration of damages. The chart below shows how the allocations to the three funds alters over time.

Figure 6 – Assumed Index Linked Gilt Strategy



B.9 This strategy reduces the risks of the claimant suffering from projected increases in interest rates. Any allocations to index-linked gilts in the assumed claimant investment strategy are assumed to be invested in this way.

B.10 The table below demonstrates the difference between the two strategies:

Table 14 – Median of gilt return simulations

Median money weighted real return %pa	5 years	10 years	15 years	20 years	30 years	50 years
Index-linked Gilt – all stocks index	-3.5%	-4.7%	-4.4%	-4.0%	**-3.4%**	-2.2%
Informed ILG strategy	-2.2%	-2.8%	-2.6%	-2.3%	**-1.8%**	-1.1%
Conventional fixed interest gilts	-1.3%	-1.5%	-1.4%	-1.2%	**-0.9%**	-0.3%

B.11 The 'Index-linked Gilt all stocks index' assumes an investment in a broad UK all-index-linked-gilt index fund. The 'informed ILG strategy' adopts a more considered approach to constructing the index-linked gilt portfolio as outlined above that is reflective of the claimant's 30 year damage profile.

B.12 Note that, given investments in conventional fixed interest gilts are not considered as hedging or matching assets (because they do not protect against inflation risks), we assume that these assets are held for diversification purposes and that any investment in conventional fixed interest gilts are assumed to be in a broad UK all-gilts index.

B.13 In practice, the claimant might choose to adopt a similar (duration informed) strategy for the conventional fixed-interest gilts to hedge damages which are fixed in price terms. Given that our analysis is focused on index-linked damages, we have not considered these issues further in this report.