Periodic Payment Orders: Shifting the Focus of a General Insurer's Balance Sheet

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Abstract

Periodic Payment Orders (PPOs) are a new type of compensation award in the UK that motor insurers in particular are heavily exposed to. PPOs involve making a series of payments to an individual to pay for care costs for the rest of that person's life. The resulting effect is a significant growth in a motor insurer's reserves. It is unclear how long this growth will continue or what the implications of growing PPO reserves on a general insurer's balance sheet are. This paper aims to address these concerns by creating a hypothetical motor insurance company and projecting their reserves using assumptions based on market statistics. This paper also analyses the variability of PPO reserves over time by testing key assumptions. My conclusions affirm this significant growth and the variability inherent in PPO reserves. Furthermore, they affirm the gradual shift in make-up of a typical motor insurer's balance sheet from non-life reserves to life reserves.

Acknowledgements

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Contents

List of Tables

List of Figures

1. Introduction

Periodic payment orders have been in existence for nearly 10 years but only really accelerated as a means of settlement in 2008. Since then, their use as a means of settling large catastrophic bodily injury claims has been widely used in the UK. The key difference between these types of settlements and the normal one-off payment in settling general insurance claims is that these claims are affected by longevity risk[1] and continue to pay a stream of money for as long as the claimant will live. An insurance company that has PPOs awarded against them must hold a reserve to administer these payments into the future meaning the claim is never fully settled with finality on cost until the claimant dies, potentially up to some 60 years after settlement.

As I will demonstrate in this report, PPOs are going to be a very significant subset of the overall gross claims of a general insurer[2], particularly if they sell motor insurance. I will also demonstrate how sensitive reserve estimates are to the selected reserving basis; hence the proportion of reserves consisting of PPOs can vary widely for an insurer and this is a challenging area for the industry.

Periodic payment orders are still relatively new in the UK and not much literatures exists other than practice area working parties such as the Institute and Faculty of Actuaries (IFoA) working party on PPOs. As such, much of my research has centred around the IFoA working party papers on PPOs which have been published yearly since 2010. Each year the working party obtains industry data from willing participants and refreshes many of the key indicators relevant to PPOs, in addition to focusing on new areas that have not been explored. Many of my assumptions are based off these papers as it contains the most widespread UK data collection specific to PPOs that is publicly available.

[1] Risk that a person outlives the life expectancy assumed at the outset
[2] Insurance company writing non-life related policies

There has been much debate on how PPOs are going to affect an insurer's balance sheet but to what extent, is unclear. The most recent IFoA PPO working party paper (2013) indicates that the number of PPO settlements per year appears to be stabilising allowing a more robust projection of balance sheet reserves to be projected assuming this frequency remains consistent.

There are many challenges an insurance company will face by having a growing level of mortality and inflation linked reserves. This report attempts to estimate when stability in a general insurer's balance sheet is likely to return and the challenges the insurance industry faces as a result of growing long term PPO reserves.

This report begins by giving some background to PPOs and how they have evolved since the introduction of legislation allowing for them. I build on this background by describing a general insurer's balance sheet and the reasons why PPOs affect them. This background allows me to set the scene for a typical UK motor insurer and allows me to project/model their balance sheet for the next 40 years. The model and assumptions are described in full before the results are presented in section 4. The assumptions are then tested for their sensitivity to the results and a number of scenarios are considered. This demonstrates how sensitive the assumptions are to PPO valuations and hence the potential for PPO reserves to be a major concern on the balance sheet. Finally, I outline the implications of growing PPO reserves for the industry based on my results and wider analysis carried out by the industry.

2. Background

A Periodic Payment Order (PPO) is the term used to describe a compensation court award with an annuity characteristic, normally awarded to severely injured individuals as a result of negligence of a third party and injury due to accidental damage (e.g. car accident). They were introduced by the Courts Act (2003), replacing their predecessor structured settlements (PPO Working Party, 2010). The injuries involved in these types of settlements are comparatively rare and normally have long term effects, both psychological and physical, for example, brain injury to a child causing development issues and loss of independent life, requiring supervision and care for the rest of their life (Cobham Hire Services Limited v Benjamin Eeles, 2009). In the extreme, these cases can involve Persistent Vegetative State (PVS) requiring round the clock care assistance with 2/3 full time care assistants for as long as the claimant lives. The costs associated with this level of care are significant and normally require a series of payments until the patient dies.

The more conventional way of settling serious injury compensation cases in the past was to award a lump sum payment based on the Ogden Tables[3] which effectively leaves the claimant in full control of a significant sum of money to be used to pay for medical expenses (and other expenses[4]) typically for the remaining lifetime of the claimant. The claimant is then expected to ensure the lump sum payment is sufficient to meet all costs associated with the injury for their remaining life. If the claimant runs out of money there is no recourse.

The current Ogden Tables calculation which is explained in more detail later assumes the lump sum can be invested risk free at 2.5%p.a. which is difficult in today's financial

[3] Government Actuaries Department compiled Ogden Tables for personal injury and fatal accident cases

[4] E.g. Loss of earnings, improvements to home in order to make it suitable for home care

markets[5] without taking additional risk (Leigh, 2013). In addition to the risk of underperforming investments, the claimant must manage the risk of high care cost inflation eroding the value of the original lump sum. Hence, in a situation where interest rates and general inflation (e.g. RPI[6]) are low but the cost of care is rising (e.g. due to a lack of supply of specialist carers) at a much faster rate than general inflation the claimant could end up eroding the lump sum faster than anticipated under the Ogden Tables calculation and could potentially end up with their funds depleted, yet still require funds to maintain their care needs.

Therefore, PPOs are designed to ensure the claimant no longer has to manage these risks. The typical structure of a PPO is a prescribed annual payment that meets all required care and other costs in today's value, that will increase every year in line with a selected index (normally the ASHE 6115[7]) and this will normally continue until the injured party dies.

PPOs are normally awarded against large (stable) institutions such as government bodies and insurance companies. A judge can only award a PPO if there is sufficient evidence to ensure continuity of payment (Weir, 2014), for example, in the case of general or motor liability claims, the Motor Insurers' Bureau (MIB) for uninsured vehicles and the NHSLA[8] in the case of negligent treatment by the NHS. In addition to this annual payment order, the claimant will normally receive a large lump sum to cover costs incurred since the incident occurred (e.g. legal fees and among other items, compensation for stress and turmoil as a result of the injuries sustained) to indemnify the claimant up to the due date of the first PPO payment. This lump sum can be very

[5] 2008 – 2014 Bank of England interest rates of 0.05%
[6] RPI: Retail Price Index (UK)
[7] Annual Survey of Hours and Earnings. Index 6115: care assistants and home carers
[8] National Health Service Litigation Authority – provides indemnity cover for legal claims against the NHS

large as a large bodily injury case can take a number of years to settle, particularly if the claimant is a minor (PPO Working Party, 2013). According to the latest PPO working party paper (PPO Working Party, 2013), the average settlement delay is currently 6.3 years (based on PPOs settled in 2012) and this is a decreasing trend with the average delay in 2009 at 6.8 years. The IFoA PPO working party paper 2013 notes longer settlement delays in younger claimants as these claimants are likely to be advised to delay settlement until they reach 18 where a fair medical prognosis of their condition can be made.

Structuring an order in this way requires the defendant (e.g. Insurance Company) to pay the initial lump sum up front (close to or after settlement) plus make a series of payments every year for the duration of the claimants' life. This is a significant shift for general insurance companies who normally write insurance contracts where premium is paid up front and claims are reported, settled and paid relatively quickly. In contrast a life insurance company receives regular payments up front but does not expect to make payments for some time as these contracts are dependent on the age and lifespan of a policyholder. Therefore general insurance companies who write non-life contracts are seeing a big shift in the time it takes to settle (or close) a claim for certain lines of business, most notably for motor insurance.

For example, a PPO awarded to a minor with no mortality impairment will continue in payment for the rest of the individual's life which could be another 60-70 years from the settlement date. It is unprecedented for a general insurance company to maintain this type of liability on their balance sheet; indeed, it would also be unusual for a life insurance company to expect to hold a liability in respect of a policyholder for this amount of time. Life insurance companies normally sell annuity contracts to retiring individuals to provide a regular income stream during retirement (PPO Working Party, 2010).

As the number of claims settling on a PPO basis increases and the company continues to write PPO exposed business, the insurance company will start to see a gradual increase in the liabilities held in respect of this line of business as the company is no longer paying as many lump sums as it previously did and instead, a number of claims are settled on a PPO basis.

The ultimate aim of the project is to model the liabilities of a motor insurer and reinsurer into the future in order to demonstrate how the characteristics of a motor insurers reserves and hence balance sheet will continue to change for a number of years until stability is reached which is likely to be many years into the future.

Thus, this report aims to explain the implications for both an insurer and reinsurer as a result of growing long term guarantees on the balance sheet, for example, the difficulty in finding assets that appropriately match liabilities, the reserve variability associated with impaired life annuities that attach to a wage index and the additional capital requirements from holding a high proportion of PPO reserves.

Furthermore, the assumptions chosen for valuing PPOs will cause the most variability. In section 4.7, I will demonstrate the impact each assumption can have on the valuation of PPO reserves and the resulting implications on the balance sheet.

Reserve variability is open to much debate as there is little guidance as to what basis should be used to value these liabilities. Naturally, a liability dependent on mortality will inevitably lead to the use of mortality tables in valuations. However, there are no relevant published UK mortality tables based on impaired lives to be used in PPO valuations. The IFoAs PPO working party are currently investigating whether such tables can be developed by using data compiled by the UK medical research database of patient records as entered by GPs. Whilst the cause of injury is not recorded, it is hoped

the data will be sufficiently close to motor-related accidents that the mortality is a suitable match (IFoA).

3. A General Insurer's Balance Sheet

This chapter briefly describes a typical general insurer's balance sheet. The balance sheet of any organisation (insurance or otherwise) is a snapshot of a company's financial position at a point in time and is typically split into three components; Assets, Liabilities and Shareholders' Funds. Assets refer to items that organisations possess and that have a positive value or create value. Liabilities represent obligations on the organisation and hence possess a negative value. Finally, the Shareholders' Funds are the funds contributed by shareholders in order to make the business viable. They are equal to the assets minus the liabilities and are effectively the book value of the organisation.

For an insurance company, we can relate the assets of the company to, for example, cash in the bank, investments in bonds or the value of properties owned by the company. The liabilities can be related to the reserves held in respect of insurance products sold where the value placed on the reserves represent the total future payments expected to be made to policyholders arising from claims. Shareholders' Funds is the amount invested in the company and can include retained earnings from previous years' profits.

Whilst all three components are important when analysing the effect PPOs have on a balance sheet, I will primarily focus on the liabilities i.e. the reserves of the insurer as this is the focus of most debate and where insurance companies have seen most change to date since the introduction of PPOs. In section 5, I briefly discuss the wider implications on the balance sheet and the business as a result of writing PPO exposed insurance products and hence having a growing profile of annuities on the balance sheet.

For general insurance companies; reserve characteristics can vary widely, depending on the type of business written. For example, personal lines household insurance generally lends itself to claims that are reported and settled relatively quickly whereas liability type claims such as employers' liability can take a number of years to establish and accordingly, a number of years to settle through the courts or otherwise. All claims, however, tend to be paid in lump sum settlements, at least in the UK. Therefore, there exists a constant addition to reserves as a result of newly exposed business and conversely a reduction to reserves as claims are settled and paid from previous years' exposure. Hence for an insurer writing a number of lines of business consistently over the past 10-20 years, except for inflation there should be no significant change in reserves (assuming a consistent reserving approach and a stable premium income). There are certain types of claims that might distort this stability such as latent claims[9] or accumulation of claims arising from catastrophe events but again these are paid out in lump sums and generally are not linked to mortality, and are not within the scope of this study.

Given the high turnover of reserves and the volatility associated with non-life insurance companies, they tend to hold very liquid assets such as significant holdings of cash and liquid assets such as short dated high security government and corporate debt (Booth, 2004). As with any low risk and highly liquid asset comes lower expected returns and hence yields insufficient to combat wage inflation and in general there is a trade-off between the level of return desired vs risk appetite.

Since the introduction of legislation allowing for PPO awards, non-life insurance companies have been faced with a different type of reserve. Until 2008, this was not a significant consideration, especially for small motor insurers. However as the number of

[9] Claims resulting from perils or causes that the insurer is unaware of at the time of writing the policy, and for which the potential for claims to be made many years later has not been appreciated. (ST7: General Insurance: Reserving and Capital Modelling, 2013)

claims settling on a PPO basis increased - based on the latest PPO working party statistics there was less than 10 PPO settlements in 2007, almost 30 in 2008 and 70 in 2009 (PPO Working Party, 2013). Insurers are now faced with a growing level of long term reserves, reserves that will not pay out as quickly as other types of claims. As a result, PPO exposed lines of business such as motor began growing as a proportion to other lines of business and the extent of which I will demonstrate in section 4. These are liabilities that will pay out in small amounts for a number of years into the future, in part; replacing the Ogden Tables based lump sum settlements.

For my study, I will focus on a hypothetical motor insurer and reinsurer purely because motor insurers are the most heavily exposed to PPO settlements in the insurance industry to date. I have decided to include the reinsurance element due to the fact that most motor insurers will buy some form of excess of loss[10] cover protecting them from the volatility associated with large claims. Furthermore, as PPOs are generally very large claims and tend to breach the excess, it is the reinsurers that are left with much of the reserve volatility as the insurer can allow for reinsurance recoveries as an asset on the balance sheet, effectively reducing the total level of reserves. Hence, depending on the attachment point of a reinsurance policy (level at which the insurer starts to cede losses to a reinsurer), the reinsurance industry faces the biggest shift in structure of reserves.

[10] Excess of Loss: Reinsurance policy that cedes all losses above an excess from the insurer to the reinsurer

4. Projecting the Balance Sheet

4.1 PPO Impact to date

Since the legislation allowed for Judges to award PPO settlements (Courts Act 2003) their use was benign in the private sector but more prevalent in clinical negligence claims against the NHS; the NHS preferred the cash flow approach (PPO Working Party, 2010). However, in late 2008 the frequency of PPO settlements increased dramatically in the private sector. There are two reasons for this; firstly, in the Thompstone versus Tameside and Glossop Acute Services NHS Trust case, the method upon which the annual payments can be indexed was changed and the judge allowed for another index other than RPI to be used. This set a precedent for future PPOs to settle on an index that is more appropriate to the inflation associated with specialist care costs, i.e. wage inflation. Secondly, the global credit crunch and stock market crash of 2008/09 dampened confidence in financial markets resulting in low investment returns and subsequently made guaranteed regular payments more attractive to claimants (PPO Working Party, 2010).

Following the sharp rise in PPO settlements in 2008, this trend continued in 2009 and 2010 where it appears to have stabilised at approximately 80 motor PPOs per annum (PPO Working Party, 2013). PPOs are now well established and look set to be a permanent feature of catastrophic motor bodily injury claim settlements, whether this will change in the future is difficult to say. It has been reported that the discount rate used in the Ogden lump sum calculation is due to be reviewed. Any reduction in the discount rate will increase the value of lump sum settlements therefore making them more attractive to claimants. Furthermore, confidence in the financial markets is gradually on the rise with increased investment returns expected, therefore claimants may push more for a lump sum settlement if they think they can obtain a better rate of return than that assumed by the Ogden Table discount rate.

The IFoA PPO working party paper 2013 conducted an analysis of settled PPO reserves in the UK motor insurance market as a percentage of the FSA[11] returns 2012. Their study concluded that settled PPOs as at 31st December 2012 made up somewhere between 7% and 19% of UK motor reserves. Considering PPO claim numbers are relatively small compared to non-PPO motor claims, this is a significant proportion after just 4 years of increased PPO frequency.

What is quite clear in recent years is that a claim settling on a PPO basis is more expensive than a claim settling on a lump sum basis, this is primarily due to the discount rate used to calculate lump sum settlements. At 2.5% real discount rate, this means an insurer would need to earn in the region of 7% a year on the lump sum equivalent if it was to fund a PPO, assuming the annual payments are going to increase by 3% to 4% per annum (Leigh, 2013). Given general insurers primarily invest in high security assets; a return of 7% is unlikely without taking additional risk, something general insurers are averse to, as they generally prefer short term liquid assets.

4.2 Hypothetical Insurer

In order to demonstrate the likely impact PPOs could have on a typical motor insurer's balance sheet I have created the hypothetical insurance company, InsureYourMotor Plc. It is assumed that InsureYourMotor writes £500m in premium per annum. Before the introduction of PPOs, InsureYourMotor pays claims of approximately £360m per annum and this is broken down by small homogenous claims known as attritional claims and large claims greater than £1m.

InsureYourMotor purchases its own insurance (i.e. reinsurance) to limit the volatility associated with very large claims. This is very common the UK motor insurance market.

[11] Financial Services Authority (Former UK Financial Services Regulator)

InsureYourMotor has purchased a policy that cedes any losses above £1m to the reinsurer; hence InsureYourMotor is liable for the first £1m of every claim and the reinsurer liable for anything in excess of £1m. Based on a deductible of £1m, it is the reinsurers that bear most of the cost of PPO claims since the larger a claim estimate, the more likely it is to settle as a PPO. According to the latest IFoA PPO working party paper, over 70% of claims between £5m and £10m settle as PPOs (PPO Working Party, 2013).

The date of this analysis is 31st December 2013. So far, InsureYourMotor has had 20 PPOs awarded against them starting in 2008. Going forward, InsureYourMotor will have 4 claims per annum settling on a PPO basis. The IFoA PPO working party paper 2013 suggests stability has been reached in PPO settlements and that there are approximately 8 PPOs settling per £1bn of gross earned premium per annum. Before the introduction of PPOs, InsureYourMotor had 9 large claims on average settling every year. It is assumed that the settled PPO claims are classified as large claims and as such the large claim settlement count reduces by 4 PPOs going forward. Also, it is assumed potential PPO claims are reserved on a large claim basis prior to settlement i.e. average cost of large claims.

InsureYourMotor has been writing UK motor insurance consistently for the past 20 years and it is assumed that stability in reserves is well established. InsureYourMotor had its first claim settle on a PPO basis in 2008, followed by 3 claims in 2009, 4 in 2010, 2011, 2012 and 2013. As at 31st December 2013, InsureYourMotor had total reserves of £740m, of which £90m (12%) relate to PPO reserves from the 20 that settled prior to 31st December 2013. This is within the range estimated from the FSA returns in 2012 mentioned above. At this point the amount of reserves is growing (in today's values) and will continue to grow as I will demonstrate below.

4.3 The Model and Assumptions

The model chosen to demonstrate the effect PPOs have on the balance sheet is a cash flow based model collating the future probability weighted cash flows from 4 settled PPOs per annum for the next 40 years and discounting everything to present value terms (31st December 2013). The future PPO cash flows combined with the future cash flows from non-PPO claim settlements are combined to demonstrate the growing level of reserves in present value terms.

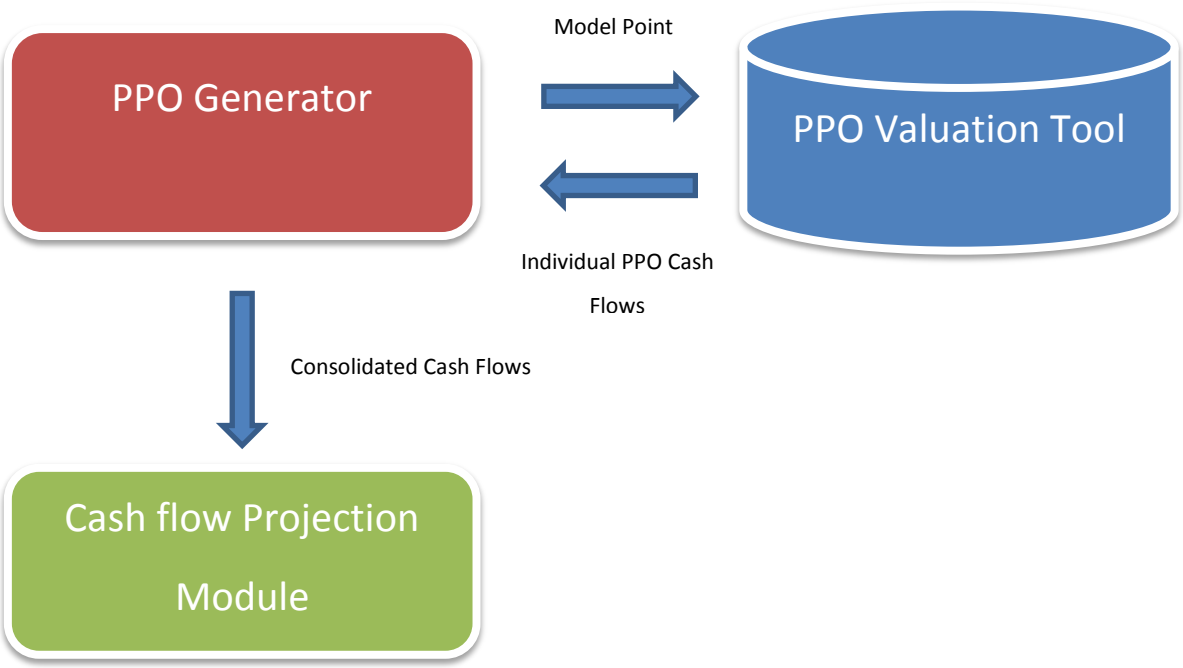

Figure 1: Model Structure

The following sections describe each component of the model illustrated in Figure 1.

4.3.1 PPO Valuation Tool

The individual PPO valuation tool uses model points shown in Table 1 which has the following criteria needed for the valuation: age, sex, initial lump sum and the yearly periodic payment amount.

PPO No	Age	Gender	Injury Type	Lump Sum (£)	Periodic Payment (£)
1	30	M	Brain Injury	1,700,000	78,700
2	30	M	Brain Injury	1,700,000	78,700
3	30	M	Brain Injury	1,700,000	78,700
4	30	M	Spinal	2,300,000	112,600
5	30	F	Brain Injury	1,700,000	78,700
6	30	F	Brain Injury	1,700,000	78,700
7	30	F	Brain Injury	1,700,000	78,700
8	30	F	Spinal	2,300,000	112,600

Table 1: PPO Model Points

The model points were chosen based on statistics observed from the latest IFoA PPO working party paper (PPO Working Party, 2013). There are 4 female and 4 male model points, all aged 30. According to the IFoA working party paper 2013, approximately 71% of settled motor PPOs are brain injury related and 22% spinal injury related, 7% other injuries. The IFoA paper derives a mean initial lump sum and a mean PPO payment per injury type. I have used these as a basis for my model points by assuming 75% of settled PPOs will be brain injury related and 25% spinal injury related. Hence, 6 model points relate to brain injury (3 male, 3 female) and 2 model points relate to spinal injury (1 male, 1 female).

Note that the age at settlement remains the same for all model points (30 years of age). This is because altering the age can have a significant effect on the future life expectancy and hence the individual PPO results which will distract from the uncertainty surrounding the assumptions chosen and hence the purpose of the model. 30 years of age is based on the median age (28.5) of all settled motor PPOs from the IFoAs working party paper 2013.

The valuation model assumes all PPOs are indexed to a wage inflation index (e.g. ASHE) with assumed inflation of 3.5% per annum. Much of the literature available currently suggests 3%-4% future wage inflation hence I have chosen 3.5%.

All future payments are discounted at 2.5% per annum with payment assumed to be made half way throughout the year. This is based on the assumption that insurance companies are investing in high security assets such as short dated government bonds and according to (Leigh, 2013), choosing a discount rate of 1% below the annual increases (i.e. -1% real discount rate) would indicate a return close to that achievable by short term government bonds.

The individual valuation tool is a probability weighted cash flow model based on the future indexed PPO payments and discounted to present value (31st Dec 2013). The weighted probability is based on a mortality factor derived from the Office for National Statistics 2008-based mortality tables. This factor effectively reduces each future payment by an amount each year based on the probability of the claimant surviving. Hence, in the year of the claimants 80th birthday, the probability of survival will be a lot lower than it was 40 years previously and hence the mortality factor will be a lot higher at age 80.

Mortality is derived from the same basis as used in the Ogden Tables 7th Edition which is the Office for National Statistics 2008-based projections. PPOs are normally awarded to severely injured claimants and hence in most cases there is an element of impaired mortality. The IFoA PPO working party paper conducted an analysis on observed impairment to date which suggests a mortality loading of 3.3 times normal mortality for males and 4.4 for females. However, at this early stage with a relatively small pool of PPOs and even smaller pool of deaths to date, there is little to decipher from these results. However, it is clear there is an element of mortality impairment.

Therefore, my mortality assumption also includes an impairment element. I have chosen a multiplier of 3 for the mortality load for both males and females. This is based on the lower of the impairment observed to date. It also compares closely to the multiple implied if the selected mortality used for calculating the lump sum was used (PPO Working Party, 2013). This forms my reserving basis to which I can compare scenarios and perform sensitivities on the assumptions outlined in table 2.

PPO Valuation Assumptions (Selected Basis)	
Inflation	3.5%
Discount Rate	2.5%
Life Expectancy Tables	ONS 2008-Based Projections
Mortality Impairment	3 x Normal Mortality

Table 2: PPO Valuation Assumptions

In order to produce both the insurer's expected cash flows and the reinsurer's expected cash flows; I must make assumptions surrounding the reinsurance treaty in place. It is common in the UK liability reinsurance market to have an indexation clause in order to protect a reinsurance limit getting eroded by inflation due to the delay between the policy inception and date of settlement. The same adjustment applies to the deductible which benefits the reinsurer from inflation eroding the value of the deductible. As a consequence, the deductible agreed at policy inception (£1m) is increased according to a wage inflation index until the claim settles. Based on the assumptions selected in the model the deductible is approximately £1.2m in today's value when the claim settles as a PPO. Subsequent to settlement, the deductible continues to increase in line with the chosen indexation of the PPO award and therefore the insurance company continues to pay a portion of the PPO every year, this called deductible creep.

Reinsurance Treaty Assumptions	
Retention	1,000,000
Indexation Clause	Full Index Clause
Indexation clause inflation	3.5%
Delay to Settlement	6 Years

Table 3: Reinsurance Assumptions

4.3.2 PPO Generator

The PPO Generator is designed to select a PPO model point from a set of 8 model points (Table 1) to be fed into the valuation tool and obtain a set of cash flows. Cash flows obtained from the valuation tool include the gross reserve excluding any reinsurance otherwise known as 'From Ground Up' (FGU), reserve to the insurer after reinsurance recoveries (net reserve), and finally the reinsurer reserve. The PPO Generator selects 4 random PPOs from the 8 model points in Table 1 every year for 40 years.

The 4 PPO cash flows for a given year are summed in order to generate a series of consolidated cash flows for the next 40 years, each year containing the cash flow of 4 settled PPOs.

4.3.3 Projecting the Reserves (Cash flow projection module)

The consolidated cash flows from the PPO Generator module are input into a projection module which calculates the reserves at each year end valuation for the next 40 years. Reserves consist of 3 types of claims; attritional, large claims and PPO claims.

Attritional claims in this study are classified as all claims smaller than £1m and generally consist of the less severe claims such as car accidents causing extensive damage to the vehicle or property but the driver and passengers escape with minor injuries such as whip lash, scrapes and bruises. These types of claims are high frequency in nature, 90%

of claim numbers in a given year are under £1m (Brown, 2012). These claims are generally reported to the insurer, settled out of court and paid relatively quickly.

Large claims in this study are classified as any individual claim greater than £1m. This is the category of claims that involve more serious accidents and are fewer in frequency; they are also the claims category that have involved PPO settlements in recent years. Therefore, this model has assumed InsureYourMotor will incur 9 large claims every year, 4 of which will settle on a PPO basis and 5 on a lump sum basis.

The assumed average cost of a large claim is £2m. Hence, for every large claim that InsureYourMotor pays out, there will be a recovery of £1m from the reinsurer. It is assumed the reinsurer does not pay for any claim under £1m as this is below the retention. The model also assumes no aggregate deductible[12] so there is no capping of the reinsurers losses in respect of the number of PPOs or large claims that can be reported, i.e. the insurer is liable for the first £1m of all claims.

Finally, for PPO claims, the consolidated cash flows from the PPO Generator are entered into the projection model and resulting reserves are calculated for each future year by subtracting the cumulative PPO payments to date from the ultimate (total) PPO cost up to that point.

The cash flow projection model is split into three main components:

- From ground Up (FGU) reserves - InsureYourMotor's gross reserves.
- Insurance Net Reserves – InsureYourMotor's net of reinsurance reserves.
- Reinsurance reserves – those reserves that are ceded to the reinsurer.

[12] Insurance mechanism common in reinsurance that aims to mitigate the reinsurers losses in any given year.

Each of the three components is derived from the PPO Generator module described in section 4.3.2. Table 4 outlines the assumptions and inputs to the projection module. These combined with the cash flows from the PPO Generator are the basis for projecting the reserves.

Cash Flow Projection Assumptions	
InsureYourMotor Premium Income	£500m
Premium Growth	2.50%
General Claims Inflation	2.50%
Discount Rate	2.50%
Attritional Claim Loss Ratio	60%
No. of Large Losses	5
Average Cost of Large Claims	£2m

Table 4: Cash Flow Projection Assumptions

4.3.3.1 InsureYourMotor's Gross Reserves (FGU)

From ground up estimates of PPOs are the 100% cost of settling a PPO claim. It is assumed there are no recoveries prior to settlement or any shared liability between insurer and claimant or any other parties involved in relation to the 4 PPO settlements per annum.

The ultimate PPO reserve for every year is calculated by summing the FGU PPO ultimate from each year and subtracting the paid amounts to date in respect of each PPO ultimate. All future PPO ultimates are discounted to the as at date ensuring all reserves are in present value terms. An assumed discount rate of 2.5% has been selected; this is consistent with the rate of discount used in the PPO valuation tool.

Note every PPO ultimate includes the lump sum element that can be a significant portion of the overall ultimate; however this does not form part of the ultimate reserve as it is assumed the lump sum element is paid immediately when the PPO settles. PPOs

are assumed to settle uniformly throughout the year, as are the attritional and large claim settlements.

Figure 2 illustrates the combined cash flow and reserve over the next 40 years for PPOs only. For simplicity, this excludes any PPOs that settled prior to 2014 as these require a separate analysis, and the following graph is for PPO cash flow illustration purposes only. The cumulative payments from 4 settled PPOs per annum rise consistently over the 40 year projection however the reserves rise relatively quickly, then begin to level or rise at a slower pace as the annual payments in respect of PPOs are almost as large as the reserves from 4 newly settled PPOs in that year.

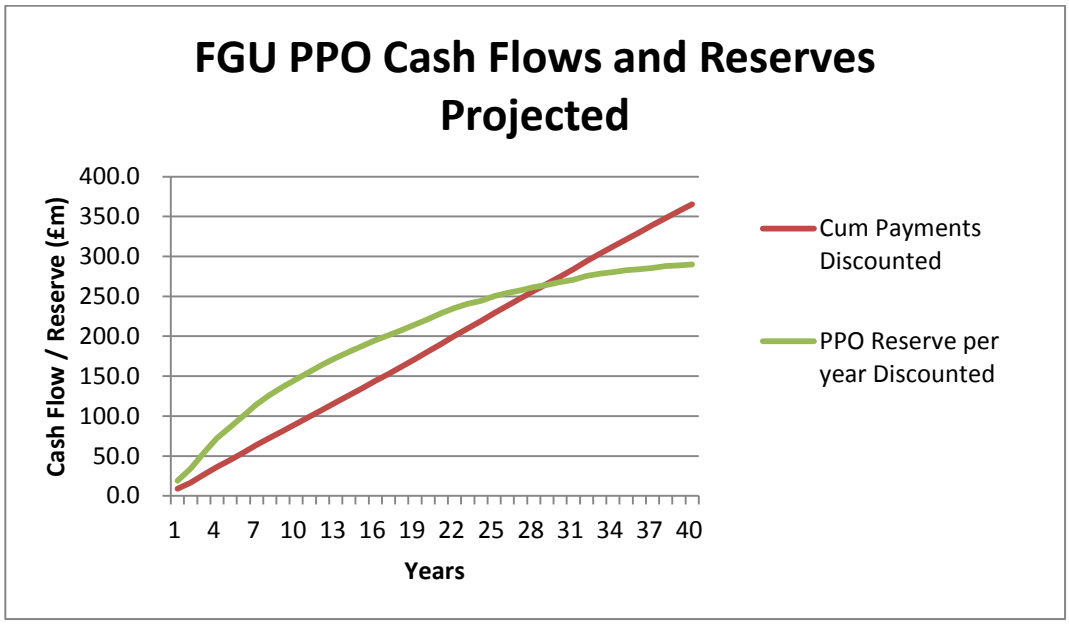

Figure 2: The green line shows the increasing level of reserves over the next 40 years with gradual stabilisation. The red line shows the increasing annual amount of all settled PPO payments per year.

Figure 3 Illustrates the convergence of the annual payments in respect of all settled PPOs at each point in time verses the additional reserve in respect of newly settled PPOs

at each point in time (i.e. 4 per year). It is expected that stability in reserves will be obtained when these two converge.

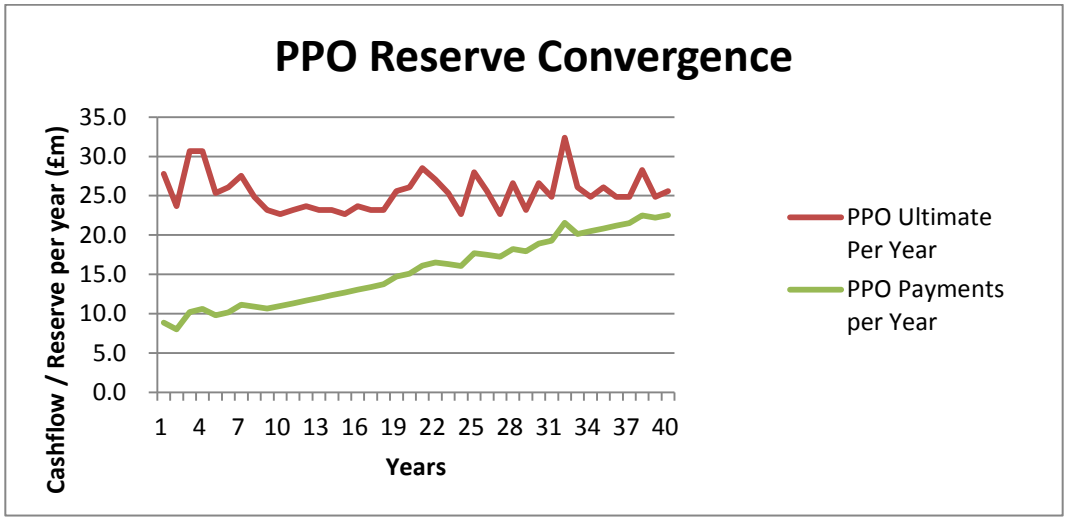

Figure 3: The gap between the red and green line at any point in time represents the additional reserve that is needed in respect of the new PPOs that settle in that year.

At the 40 year point, newly settled PPOs contribute approximately £25m on average to reserves in today's values but the payments in respect of all settled PPOs since 2014 is approximately £22m on average, hence the additional reserve required is £3m. This contrasts with year 5, for example, where there is £25m of new reserves versus £10m of payments on average in that year, hence the additional reserve required is £15m.

Non-PPO related claims, i.e. attritional and large claims, are also projected for the next 40 years and discounted to present value. However, given the reserves for non-PPO claims remain constant, there is no increase in reserves in present value terms. Both attritional and large claims have claims inflation that is assumed to be the same as the discount factor i.e. 2.5%. This is also consistent with the premium income growth

assumed for each year. Hence in present value terms, premium and non-PPO losses remain consistent for the purpose of this analysis.

Cash flows from non-PPO claims also need to be projected. To do this I have assumed a cash flow pattern for each type of loss. Attritional claims are assumed to be fully paid approximately 6 years post inception and large claims (non-PPO) are assumed to be fully paid in approximately 9 years, both significantly shorter than PPO claims which are expected to be fully paid approximately 40 years post settlement (under the basis described above).

4.3.3.2 InsureYourMotor's Net of Reinsurance Reserves

As noted previously, the insurer's reserves are shielded somewhat by the impact of PPOs by the reinsurance program they purchase. The lower the attachment point (deductible) of the reinsurance contract, the lower the impact on the balance sheet. However they will pay a higher premium for reinsurance as a result.

Given all claims above £1m hit the reinsurance layer, InsureYourMotor's net reserves will include all attritional claims, the first £1m of large claims and the first £1m of PPO claims plus the deductible creep from PPO claims. Therefore the net of reinsurance reserves remain relatively stable over the course of the projection period as I will demonstrate in section 4.5.

4.3.3.3 Reinsurance Reserves

For simplicity I have assumed all PPOs that settle are for claims that would otherwise be large claims and hence the present value ultimate cost of all PPOs is at least £1m. There is evidence of settled PPOs with a value of less than £1m, or their equivalent Ogden Lump sum value is less than £1m but these are few and insignificant, and have been ignored for this analysis. The propensity of claim a to settle as a PPO for a value less than

£1m is deemed insignificant according to (PPO Working Party, 2013). Therefore it is assumed that all PPOs awarded against InsureYourMotor plc are large enough to breach the reinsurance deductible and hence there is a recovery from the reinsurer. As previously noted, PPOs are normally awarded in the most severe of cases and therefore have a high cost involved and with a deductible of £1m, the reinsurer is impacted most by PPOs.

Attritional claims have been omitted from the reinsurer analysis as these claims are all less than £1m however large claims still create recoveries for InsureYourMotor. Given the average large claim is £2m, the recoveries are simply 50% of the total loss for large claims.

For the reinsurance reserve projection we have assumed a 100% share of recoveries. In practice, recoveries are generally shared by various reinsurers to spread the risk. However, a reinsurer is likely to reinsure a number of insurance companies under a similar structure, so assuming a typical reinsurer accepts a 20% share per reinsurance program and assuming they underwrite 5 insurance companies of similar premium volume and structure to InsureYourMotor plc with a similar loss experience, it can be assumed that the reinsurance impact illustrated below is the impact on the reserves of a typical UK motor reinsurer.

4.4 InsureYourMotor's Gross results

Figure 4 illustrates the impact PPOs have on an insurer's gross reserves given the basis selected.

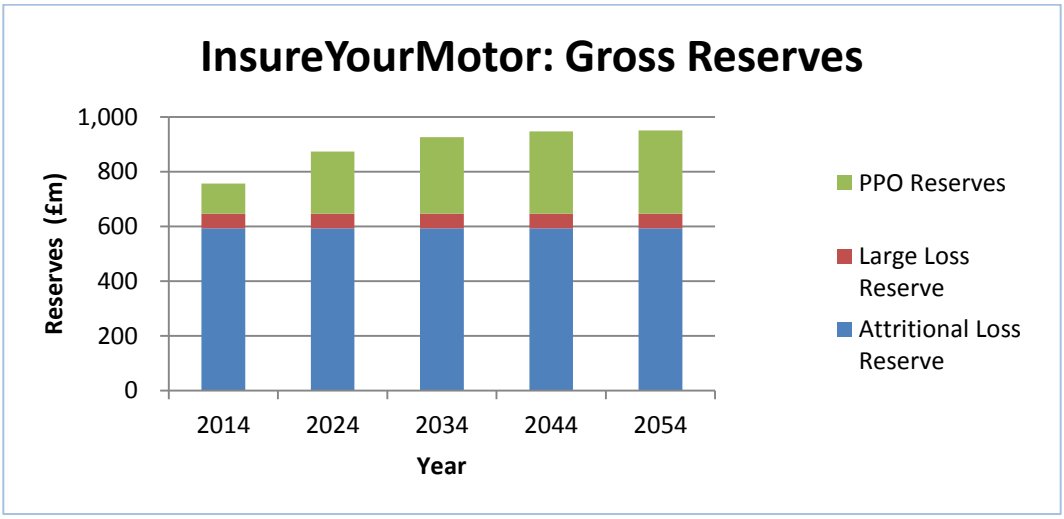

Figure 4: Blue and red sections represent the non-PPO claim reserves, note how they remain consistent over the projection period. Green sections represent the PPO reserves.

The first thing to note is the level of attritional and large claims reserves remain consistent over the projection period of 40 years. At the beginning of the projection, InsureYourMotor had approximately £750m in total reserves, 15% of which consist of PPO reserves from pre 2014 settled PPOs. This is a significant proportion of reserves after just 6 years of PPO settlements (20 PPOs in total).

The average PPO ultimate per year in present value terms is £25m and the average payment in respect of that ultimate that occurs in the first year is £8m, meaning £17m is contributed to reserves in respect of newly settled PPOs per year on average. During 2014, payments in respect of settled PPOs to date is £1.8m (pre 2014 settled PPOs only),

leaving a £15.2m gap between reserve increases and payments. Hence the rapid increase in reserves as a result of the slow payment profile of PPOs.

InsureYourMotor's reserves are expected to increase by 15% over the following 10 years, at which point, PPO reserves will make up almost 26% of gross reserves. In 20 years' time, reserves will have jumped 25% with PPO reserves making up 32% of total reserves.

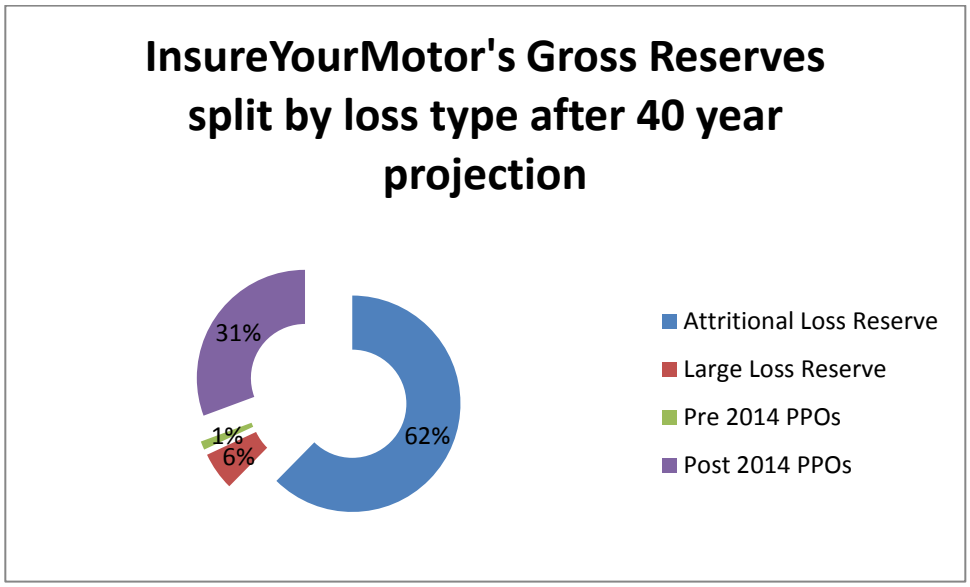

Figure 5: Reserves split by loss type in 40 years

At the 20 year point, the addition of reserves is still relatively high at £5.5m (present value) but at the 30 year point the addition in reserves is much lower at £2.5m and finally it is approximately £0.6m at the 40 year point. Clearly there is a gradual decrease in the addition to reserves over the 40 year projection. As mentioned above, the payments from all settled PPOs and the addition of new PPO reserves are starting to converge, hence reserves appear to be stabilising 20-30 years from now. Figure 6 demonstrates this gradual stabilisation. Note this is based on the reserving basis

mentioned throughout this report, choosing a different basis can have a very different affect as demonstrated in section 4.7 of this report.

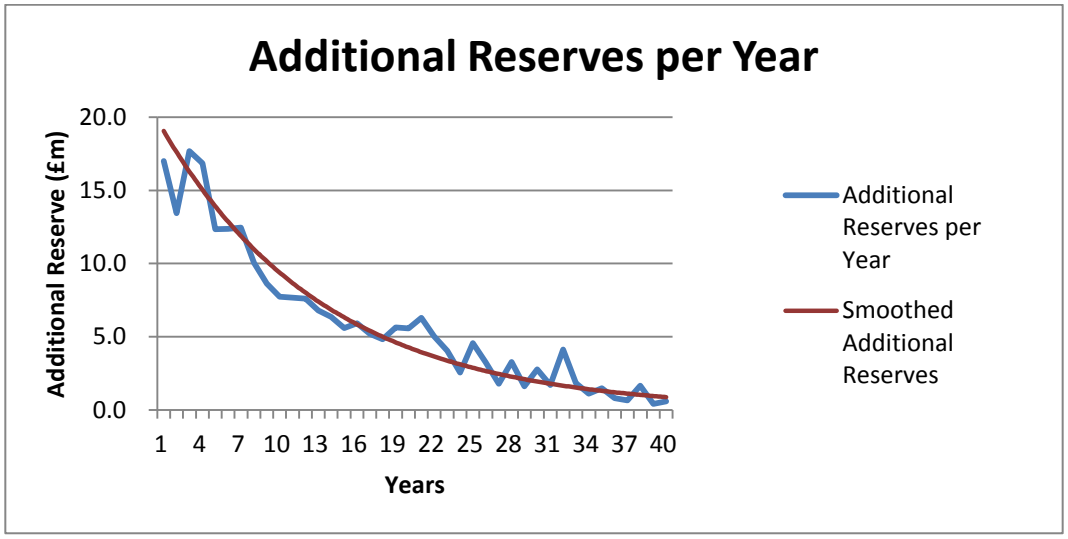

Figure 6: Additional PPO Reserves per Year

4.5 InsureYourMotor's Net Results

The net of reinsurance effect of PPOs on InsureYourMotor's reserves are shown in Figure 7. As noted previously, the net effect to InsureYourMotor's reserves is quite small. Give the lump sum component of PPOs used in this analysis is greater than £1m, InsureYourMotor is only exposed to the first £1m of a claim, indexed under the terms of the reinsurance treaty and it is exposed to the deductible creep from the subsequent periodic payments.

In fact, the reserve shown in respect of PPO reserves in Figure 7 is purely the deductible creep from settled PPOs since the first £1m is assumed to be paid within a year of the claim settlement, hence does not contribute to the reserves.

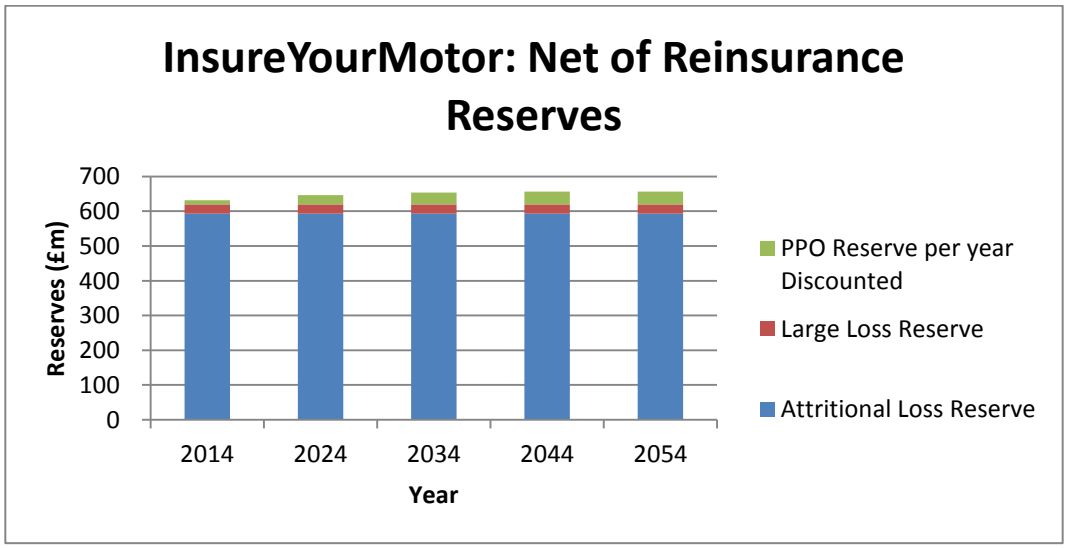

Figure 7: Level of reserves net of reinsurance. In contrast to the gross reserves, the large claim category (red) has halved and PPO reserves (green) have significantly reduced.

Similar to gross reserves, there is a sharp increase in PPO reserves initially before they begin to stabilise after 20-30 years. This increase is small and not very significant relative to the total reserves. In 2014, PPO reserves make up just 2% of total reserves, increases

to 4% after 10 years and stabilises at approximately 6% in 30 years' time, as shown in Figure 8.

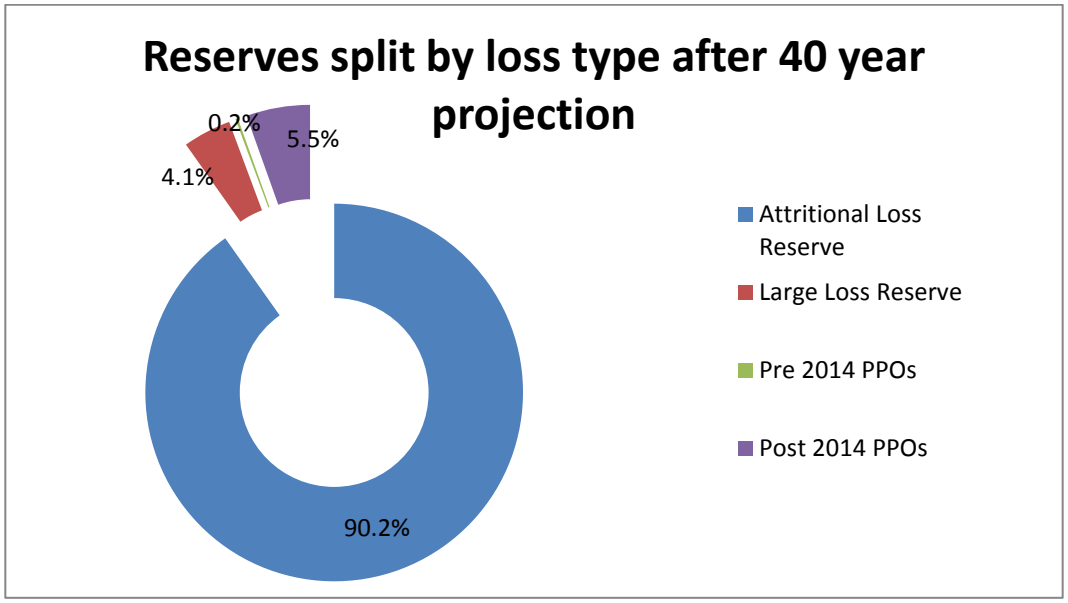

Figure 8: Reserves split by loss type after 40 year projection

The overall impact to InsureYourMotor's reserves with the introduction of PPOs appears to be insignificant. However, if InsureYourMotor had a higher deductible, the impact would be more severe. Section 4.7.3 demonstrates the effect a higher reinsurance deductible can have to an insurer; for example, there is a level of deductible that some PPOs may not reach and therefore the insurer bears 100% of the cost.

4.6 Reinsurance Results

Finally, Figure 9 shows the impact to the reinsurer. As previously noted, the reinsurer is heavily exposed to all PPOs, particularly when the deductible is as low as £1m. Figure 9 shows reserves in 2014 of £124m, 78% of which are PPO related (£97m). This is a significant amount of PPO reserves after just 7 years of PPO settlements. 10 years later, total reserves are expected to jump 82%, which is unsurprising given the impact the first 7 years has had to date already.

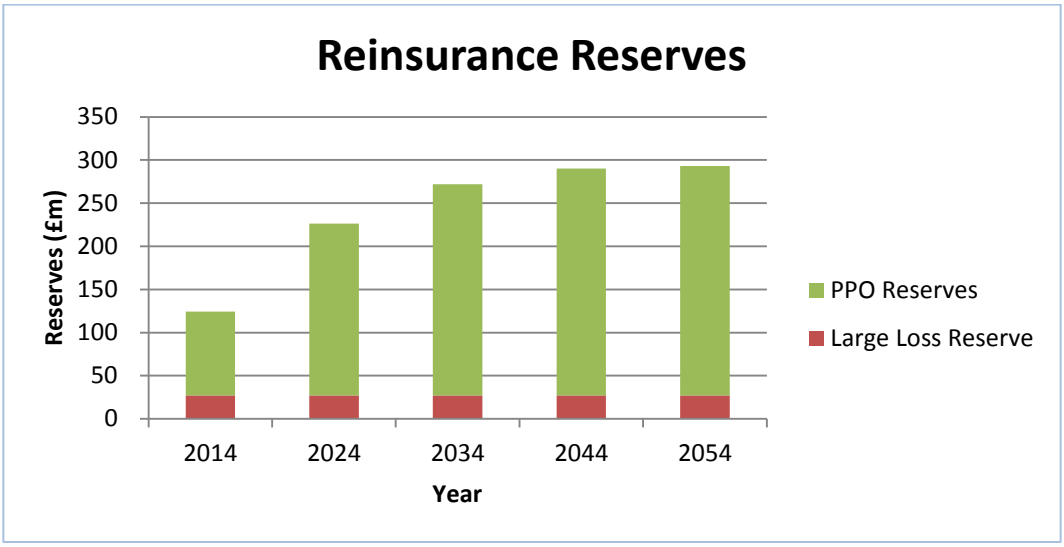

Figure 9: Reserves are approximately £124m in 2014, rising to almost £300m in 40 years' time purely due to settled PPO reserves. Note that the large claim category remains consistent over the 40 year projection.

Between 2024 and 2034, reserves are expected to jump another 20% at which point the reserves are beginning to stabilise. They increase another 7% by 2044 and another 1% by 2054. Reserves will have increased by 136% in total over the 40 year projection.

Figure 10 shows the breakdown of the reserves in 2054 by loss type. 91% of reserves will be PPO related (incl. pre 2014 reserves). This is a very significant proportion of reserves

if the reinsurer only writes UK motor reinsurance. As section 4.7 will demonstrate, PPO reserves are very uncertain and hence reserves consisting mainly of PPOs will be difficult to manage unless there are other lines of business to diversify some of the risk.

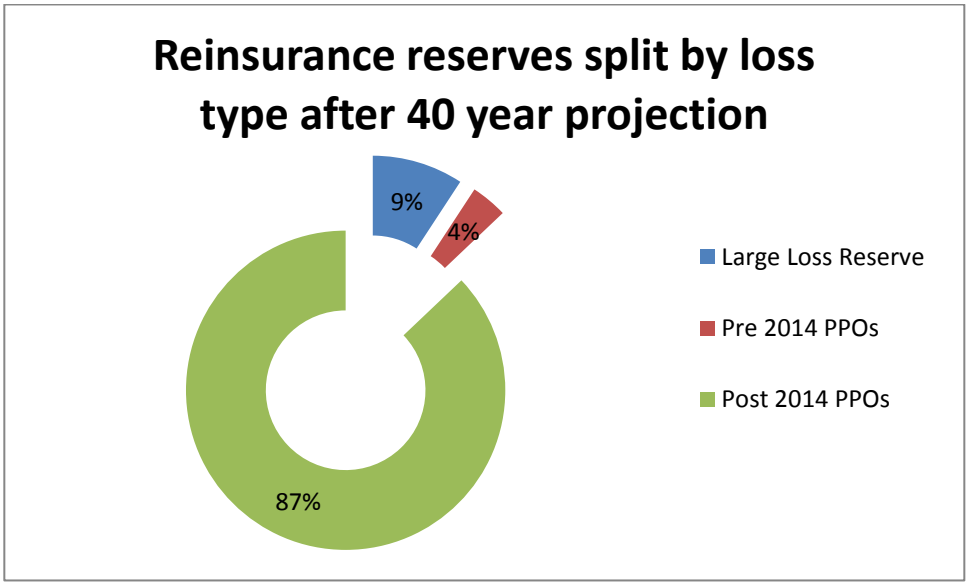

Figure 10: Reinsurance reserves split by loss type

Note, the above split indicates that 91% of a motor reinsurance company's reserves will be life dependent. Hence, a non-life insurer's balance sheet is more akin to a life insurer's balance sheet despite selling non-life insurance products.

The following section on sensitivities will demonstrate how this proportion shown in Figure 10 can change depending on:

- The deductible chosen
- Mortality assumptions chosen
- Real discount rate (discount rate less inflation rate)

The mortality projections and real discount rate chosen are the key assumptions for the reinsurance company and given the long term nature of PPOs, any deviation of these assumptions can have a big effect on the reserves. Furthermore, the level of deductible can have a large effect on the risk ceded.

4.7 Sensitivities – Reserving Basis

As mentioned, the basis chosen (assumptions) to value PPO reserves is an area not well defined in practice. The recent IFoA PPO working party survey indicates a wide range of reserving approaches adopted by the industry. The two key assumptions for valuing PPOs are the life expectancy of the claimant and the real discount rate (discount rate less inflation rate) of the future payments.

The (PPO Working Party, 2013) conducted a qualitative questionnaire with senior actuaries from both insurance and reinsurance companies involving a one hour questionnaire covering various PPO related topics including reserving methods and assumptions. Below is the life expectancy approaches adopted by the respondents:

- Annuity certain (defining the date PPO payments will cease)
- Age adjusted
- Multiplier (method adopted throughout this report)
- Additive (+/- number of years impairment)

This section will demonstrate the sensitivity of reserves to the chosen life expectancy assumption based on the multiplier method. I will produce a range of results around the selected assumption of a multiple of 3 times normal mortality[13].

From the same (PPO Working Party, 2013) survey, there was a wide range of real discount rates chosen by respondents including negative real rates of interests. Section 4.7.2 shows the sensitivity of the real discount rate to the level of reserves over the next 40 years.

[13] Office for National Statistics 2008-based mortality projections

In the following sections, I have used the original individual PPO data used to create the results above but altered the variable under the said test to create a range of reserves +/- the results outlined in section 4.4.

Finally, section 4.7.4 demonstrates the best and worst case scenarios for PPO reserves in the future. Again, the reserves are very sensitive to the assumptions chosen indicating the level of uncertainty involved in estimating PPO reserves.

The sensitivities in respect of life expectancy and the real discount rate focus on FGU estimates of PPO reserves only to demonstrate the effect of changing the selected basis or the range of possible reserve estimates that could possibly be placed on PPO valuations. Note, most of the increases/decreases will impact the reinsurer and not the insurer based on the £1m deductible chosen in the base analysis.

The following sensitivity/scenario sections give a range around the projected reserves based on the selected assumptions. Table 5 outlines these reserves for reference when interpreting the graphs.

FGU PPO Reserves (Selected Basis)	
Year	Reserves (£m)
2014	109
2024	226
2034	279
2044	300
2054	303

Table 5: FGU PPO Reserves (Selected Basis)

4.7.1 Life Expectancy (Mortality)

The selected life expectancy throughout this report is a multiple of three times the normal mortality. Meaning the probability of a person dying in a given year is multiplied by three for PPO claimants. Figure 11 demonstrates the deviation around this assumption in present value terms for the next 40 years.

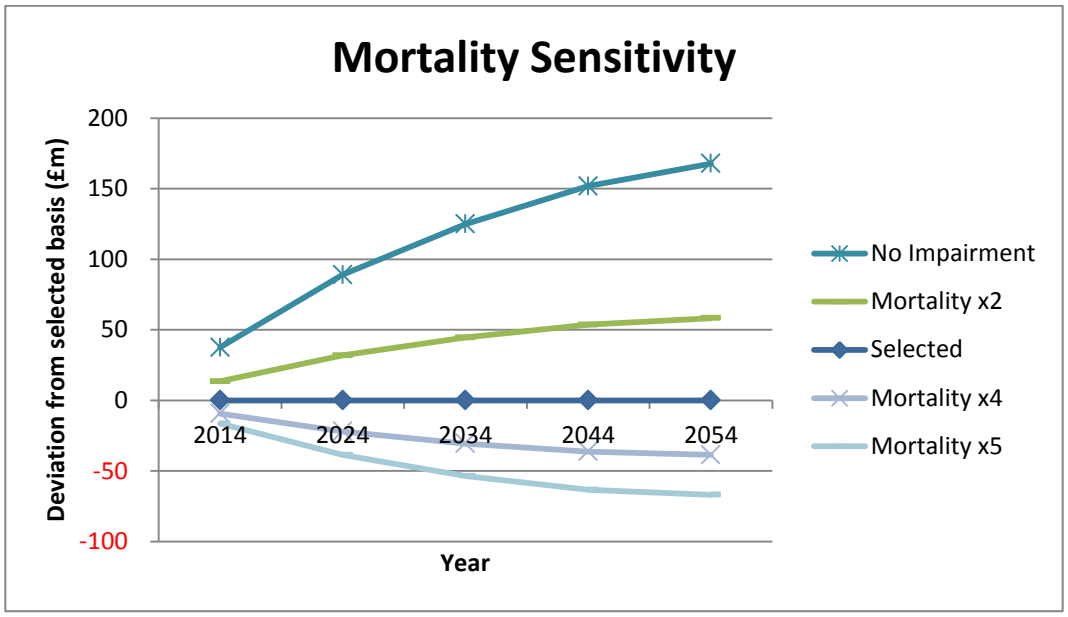

Figure 11: Mortality Sensitivity

The above analysis suggests that if life expectancy is longer than selected at 2 times mortality, reserves will be £30m higher than the selected in 10 years' time, increasing to £60m in 40 years' time. If there is no assumed mortality impairment i.e. normal mortality, reserves will be nearly £90m higher than the selected in 10 years' time, with this increasing to almost £170m by in 40 years' time.

Conversely, if life expectancy is shorter than the selected at 4 times mortality, reserves will be approximately £9m lower than selected in 10 years' time, and £39m lower in 40

years' time. If life expectancy is even shorter at 5 times mortality, reserves will be £16m lower than selected in 10 years' time and £67m lower in 40 years' time.

In 40 years' time, the difference between the lightest mortality (no impairment) and the highest mortality (x5) is approximately £230m in present value terms. This is a significant range around the selected estimate of approximately £300m for PPO reserves.

The PPO working party are currently developing an impaired life mortality table by injury type suitable for PPO claimants however it is likely to take many years before the actual mortality experience of PPO claimants can be compared to the new tables in order to test for its appropriateness. This is due to the relatively low base of PPO claimants in comparison to the general population.

4.7.2 Real Discount Rate

The selected real discount rate chosen for this report is -1%. Meaning the insurance company is discounting its reserves by 1% below the assumed inflationary increases in PPO payments. Figure 12 demonstrates the sensitivity of reserves to the real discount rate chosen.

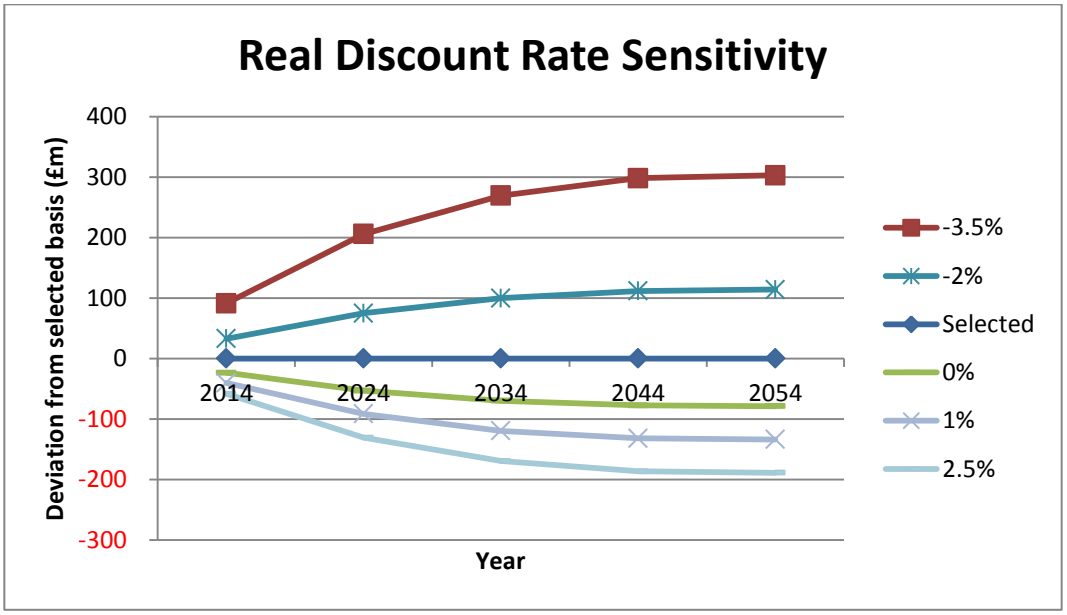

Figure 12: Real Discount Rate Sensitivity

Selecting a lower real discount rate of -2% increases PPO reserves by £74m in 10 years, and up to £115m in 40 years' time. However, if the company does not discount its PPO reserves at all (2 reinsurers out of 8 in the (PPO Working Party, 2013) qualitative survey indicated no discounting), which is a -3.5% real discount rate, reserves as at 2014 are £90m higher and this gap widens to £205m in 10 years. In 40 years, the gap between the selected real discount rate and no discounting at all is over £300m.

Conversely, if a higher real discount rate is chosen, reserves could be a lot lower. Choosing a real discount rate of 0% (i.e. 3.5% discount), produces reserves £53m lower than expected in 10 years and up to £80m lower in 40 years' time. Currently, no assets exist that match PPO characteristics exactly, but if there was, this is likely to be the selected real discount rate.

Choosing a real discount rate of 1% (i.e. discounting at 4.5%) produces reserves that could be £90m lower in 10 years' time, and £135m lower than selected in 40 years' time.

Finally, choosing the same real discount rates as used by the Ogden Tables calculation, i.e. 2.5%, produces reserves that are £130m lower in 10 years' time and almost £190m lower in 40 years' time. Again these sensitivities produce a wide range of outcomes, hence the wide range of reserving approaches adopted by the industry.

The real discount rate chosen will be dictated by the level of return obtainable on the assets backing PPO reserves. This is unlikely to be above 3% in today's financial markets without taking additional investment risk.

4.7.3 Deductible

The selected level of deductible is £1m which means the reinsurer is exposed to all PPO claims from the very first payment as all PPO model points have a lump sum element greater than £1m. As noted previously, changing the level of deductible can change the reinsurer's exposure to PPOs significantly. Figure 13 shows how increasing the deductible by £1m increments can change the split of PPO reserves between the insurer/reinsurer.

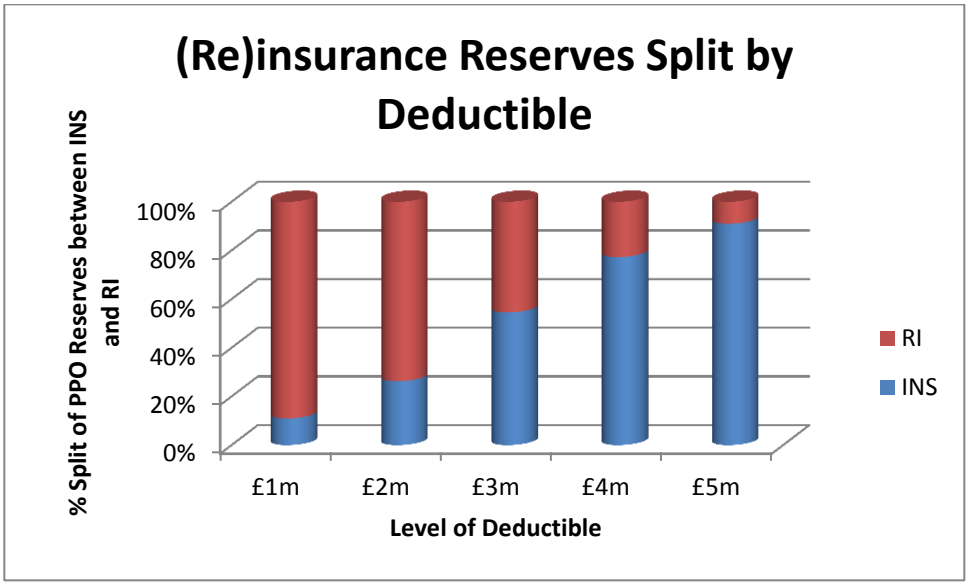

Figure 13: Reinsurance Deductible Sensitivity

The above analysis is based on reserves as at 2014. The split between insurer and reinsurer does not alter the results significantly at different points in time. At the selected deductible of £1m, the split between insurer and reinsurer reserves is 10% and 90% respectively. Increasing the deductible to £2m changes the split to 26% for the insurer and 74% for the reinsurer. The higher the deductible, the more reserves and hence uncertainty the insurer retains. At £5m, the insurer retains 90% and the reinsurer only 10%.

4.7.4 Scenarios

Finally, I carried out a number of scenarios that stress the inflation and life expectancy together around the selected basis. The discount rate remained constant in these scenarios at 2.5%. Figure 14 shows the results.

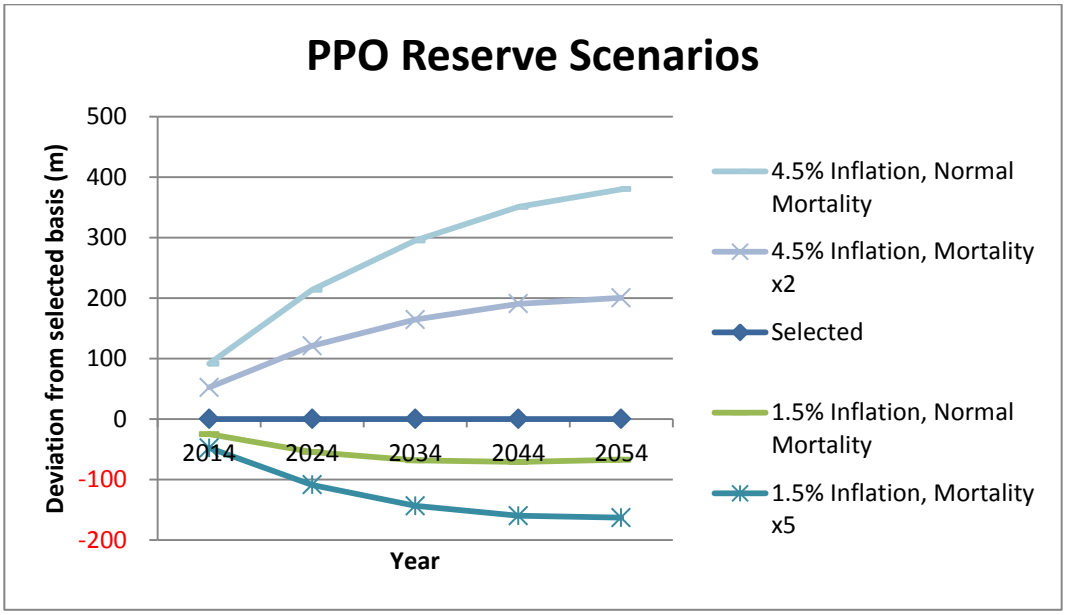

Figure 14: PPO Reserve Scenarios

At the most extreme, I assumed normal life expectancy (mortality) and 4.5% inflation (i.e. -2% real discount). At the beginning, in 2014, as the scenario is quite different to the selected basis, there is an immediate £90m difference. This difference continues to increase as more PPOs settle, rising to over £200m in 10 years, £300m in 20 years and up to £380m in 40 years' time. Of course, it is very unlikely that all PPO claimants will exhibit normal life expectancy but it is possible that a proportion of PPO claimants will have a normal life expectancy (PPO Working Party, 2013). Inflation is less difficult to predict, there will be periods of high and low inflation, however on average 4.5% would not be seen as a particularly prudent assumption (Leigh, 2013).

The next scenario used the same inflation, 4.5% but applied a mortality load of 2 times normal mortality. This produced increases on the selected of approximately half the extreme estimates.

The next scenario was testing low inflation, 1.5% (1% real discount) with normal mortality. The results show a reduction in the selected but not as much deviation as the other tests. In 2014, the deviation is £25m lower, rising to £55m in 10 years. This increase stabilises in 20 years at approximately £70m where it remains for the 30 and 40 year mark.

The last scenario tested was another extreme, using low inflation of 1.5% and low life expectancy of 5 times normal mortality. In 2014, the difference is almost £50m lower than selected. This deviation more than doubles in 10 years' time and eventually levels off at approximately £160m in 30 years' time.

5. Implications

5.1 Reserve Uncertainty

Section 4 clearly shows that reserves are going to increase over the next 30-40 years for a typical UK motor (re)insurer, however the uncertainty that comes with PPOs is greater than that of other types of claims. There will be a proportion of reserves that will exhibit more volatility than other reserves, and eventually these volatile reserves will be larger than the other less volatile reserves.

There are four main areas of uncertainty in PPO reserve estimates (PPO Working Party, 2010):

1. Life expectancy of a claimant (mortality) being different than expected
2. The level of inflation (indexation) being greater or less than expected
3. The real rate of return achieved on assets backing PPOs compared to the discount rate applied to reserves.
4. The net cost of claims affected by any reinsurer default experience

The uncertainties of risk factor 1 and 2 have been tested under the sensitivity section. The sensitivity of the mortality and discount as shown above create a wide range of results and indicate the level of uncertainty inherent with PPO reserves. Risk factor 3 suggests that if the rate of return obtained by the investment strategy of the insurance company deviates from that assumed in the discounting of the future PPO claim payments there will be gains/losses when the discounting is unwound. Risk factor 4 suggests that any reinsurer defaults will create uncertainty as the level of expected recoveries given a default will be less than that assumed previously.

Life insurance companies have similar types of uncertainties described above, particularly around mortality projections. However life insurance companies for the most part are insuring lives that exhibit experience that closely follows published mortality tables or they develop their own life tables as they have enough policyholders and history to obtain credible estimates. They also have methods of assessing mortality reserve uncertainty, but due to the relatively small volume of PPO claims there would not be sufficient data to derive credible results (PPO Working Party, 2010) if those methods were adopted for PPO reserve uncertainty. Furthermore, PPO claimants as a population are not a homogenous group (PPO Working Party, 2013), their injuries range from mild to very severe which further complicates the level of data available to derive credible results.

Given the complications with assessing reserve uncertainty (PPO Working Party, 2010) suggests sensitivity testing the key assumptions and creating scenarios as carried out in section 4 to produce a range around the chosen assumptions i.e. best and worst case scenarios.

5.2 Investment Strategy

General insurance companies tend to invest their assets in short dated, highly liquid assets such as cash and government bonds (Booth, 2004). Due to the nature of general insurance reserves and level of volatility, they must be able to liquidise investments relatively quickly. Insurance companies attempt to match assets and liabilities based on nature, term and currency. Cash and high security bonds offer the closest match to these characteristics for most general insurance liabilities. However, returns available on cash and high security bonds are unlikely to offer returns sufficient to combat inflationary increases in PPOs. Furthermore, PPO claims pay out gradually over a very long period of time, meaning the assets backing them do not need to be accessed at short notice.

Given the level of reserve uncertainty with PPOs, it is difficult to find assets that match the characteristics of PPOs. A recent presentation from the IFoAs (How to deal with PPOs in practice) investigated various asset classes to find the most suitable match for PPO reserves. UK indexed linked government bonds, UK indexed linked corporate bonds and infrastructure bonds were all investigated. The most suitable option appeared to be Infrastructure bonds as they have attractive risk vs return characteristics, they match cash flows (i.e. long term amortising cash flows), reliable revenue stream and low correlation to other assets. Furthermore, infrastructure assets are generally government backed, increasing the security of the asset.

As the reserves held for PPOs become a larger part of the balance sheet, managing the investments backing these liabilities is likely to become a bigger task and has the potential to overshadow the profits/losses from the current underwriting year. Hence managing the balance sheet will be more like managing a hedge fund than a general insurance company's balance sheet (PPO Working Party, 2010).

5.3 Capital Implications

One of the biggest considerations to insurers with large PPO exposure is the capital needed to support the reserves and ensure policyholders' expectations can be met. PPO reserves exhibit more uncertainty than non-PPO reserves and therefore the capital needs are likely to be more onerous. Not only is the capital requirement likely to be more onerous in relation to PPO reserves, it will increase as the level of PPO reserves increase. According to (PPO Working Party, 2010), PPOs have the potential to alter the motor insurance industry as a result of the capital implications.

Capital is assessed based on the underlying risks in the business; PPO reserve risk is just one aspect that will attract capital. As PPO reserves grow, the level of assets needed to support the reserves will also grow. Depending on what assets the company invests in,

there will need to be capital to support any deviation in the expected return for these assets, this capital requirement is likely to be greater for riskier investments. Hence insurers will have more exposure to investment markets (PPO Working Party, 2010). Therefore, the capital needed to support the PPO reserves in addition to the volatility in the assets backing the PPO reserves is likely to grow year on year.

The new impending European regulatory framework (Solvency II[14]) is another important consideration for insurance companies with PPO reserves. Solvency II requires companies to discount their reserves at the risk-free rate which has the potential to increase the valuation of PPO reserves if the insurance company was using a higher discount rate for published accounts. Solvency II is also likely to attract more regulatory scrutiny given the level of reserve uncertainty with PPO reserves. Regulators will want to be comfortable that insurance companies are well capitalised so that policyholders are protected.

5.4 Operational Challenges

The additional data requirements for PPO management will be more onerous for both the insurer and reinsurers that will be sharing the full cost of a single PPO. In order to manage the risks PPOs pose on the insurance industry, data will be key to quantifying the reserves and uncertainty in the future. Data will need to contain individual claimant information such as gender, age, type of injury, accident/settlement dates in addition to historic information on the index the PPO attaches to. This information needs to be maintained for the whole of the claimant's life (PPO Working Party, 2010). Operational challenges such as the following will need to be addressed; will the claimant information remain accurate in 40 years' time? Will future deaths be captured and PPO payments stopped? Will medical improvements improve a claimant's health status and the subsequent PPO payments reduced?

[14] Harmonised regulatory framework for the EU insurance industry

As the number of PPOs increase, more personnel will be needed to maintain PPO payments and reduce the operational risk they pose. If key personnel move on, will processes be maintained to the same level?

One PPO to an insurer will be reinsured by multiple reinsurers – each reinsurer taking a % of the risk. Therefore a relationship with 5/6 reinsurers for just one PPO will need to be maintained for 40 or so years. An insurer is likely to change reinsurers over the years, hence they will be dealing with and managing payments with a large pool of reinsurers for a very long time. This will add to the operational challenges of the insurer.

5.5 Pricing

There are many implications, in general, PPOs have in relation to pricing. However, many of these are outside the scope of the analysis described above, such as the frequency/severity of future PPOs. The main considerations of higher PPO reserves in pricing future motor insurance contracts are how to predict the final cost PPOs will have, as the uncertainty in the final cost needs to be quantified in order to price for the risk. According to (PPO Working Party, 2010), the increase in the capital intensity of the relevant insurance and reinsurance products would be expected to increase the technical price. The assumed level of investment return will be a key assumption as a deviation of just 1% from assumed investment return could have a significant effect on the price.

Furthermore, the higher level of capital needed to support PPOs must be held for a much longer period of time than would be assumed in a lump sum settlement. The profit required to maintain this capital would need to be allowed for in the current pricing (PPO Working Party, 2010).

6. Conclusions

Based on my analysis, overall reserves for a motor insurer are going to increase for the next 30-40 years due to PPO claim settlements, even though the insurer is writing the same level of premium over this period. PPO reserves are going to be a large and growing subset of the overall reserves and this will affect both insurers and reinsurers differently depending on the level of reinsurance cover purchased. I have assumed a low attachment point for the insurer and predict that 6% of their reserves will be PPO related in 40 years' time. However, 91% of a reinsurer's reserves are expected to be PPO related in 40 years' time. Furthermore, reinsurers reserves are expected to grow by almost 140% over the next 40 years. This growth is solely due to the slower pace of paying PPO claims over other non-PPO type claims.

These results are based on the assumption that the current number of PPO settlements per year will not change. However this may change if investment markets improve and claimants prefer to invest a lump sum instead of receiving a small amount every year for the rest of their life. Or the discount rate prescribed in the Ogden Tables may be reduced, making lump sums more attractive to claimants. Also, if an insurer were to default on its obligations, what effect would this have on the attractiveness of PPOs in the future?

One of the key considerations for insurance companies is the level of uncertainty in PPO reserves. Estimating their cost involves predicting the life expectancy of an impaired life, future wage inflation and investment returns over some 40 years. A small change in any of these assumptions can create large swings in PPO reserves, especially if there are a large number of PPOs on the balance sheet. Based on my analysis, the best and worst case scenario for PPO reserves can range from -50% to +125% of the selected basis in 40 years' time.

Having a growing level of reserves that are very uncertain has a number of implications. Due to the level of uncertainty, the capital needed to support PPO reserves will be larger than other non-PPO reserves. PPO reserves will continue to grow for the next 30-40 years and therefore the capital needed to support them will need to grow and this has the potential to alter the UK motor insurance market. Overall, there is a higher cost associated with managing PPOs on the balance sheet and this is likely to be sourced by retained profits and higher motor insurance premiums.

My analysis has primarily dealt with the reserving aspect of PPOs, however the capital implications is likely to be a major consideration for insurers both now and in the future. I would welcome further research in the capital modelling of a typical insurer such as InsureYourMotor and more specifically the reinsurer of InsureYourMotor. This is likely to be a topical area in the coming years and an area that would benefit from further analysis especially with a new European wide regulatory framework about to be introduced.

Over time, the impact of PPOs will be more understood and data will get larger and more credible, allowing more sophisticated models and assumptions to be made. It is hoped this will improve the estimation techniques of PPOs and ultimately reduce the uncertainty that PPOs currently bring to a general insurers balance sheet.

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