Taylor Fry

Comcare

PREMIUM MODEL REVIEW

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TABLE OF CONTENTS

LIST OF APPENDICES

EXECUTIVE SUMMARY

Taylor Fry has been engaged by Comcare to undertake an independent review of Comcare's premium setting process.

In our review we have made a number of recommendations that take into account of the views of Comcare, the Safety, Rehabilitation and Compensation Commission and a number of employers in the Comcare scheme. These recommendations are listed below and commentary on each is found in Section 4 of the report. All recommendations are consistent with the Commission's *Premium Determination Guidelines.*

Recommendation 1: *Use reported incurred cost rather than estimated total lifetime cost as the basis for measuring an employer's past claim performance.* In effect this recommendation is to 1) drop the current loading for unreported claims when measuring claim performance because it is unnecessary and it reduces transparency and 2) retain statistical case estimates because the possible alternatives have important limitations.

Recommendation 2: *Adopt a simplified and more transparent premium model.* The recommended model will produce premiums that are more stable yet have the appropriate responsiveness to changes in an employer's claim performance. This recommendation was in response to a key theme from employer consultations – that the current premium model lacks a clear and transparent link between premiums and claim performance.

Recommendation 3: *Update the Premium Quick Reference Sheet to be consistent with the new model and give more attention to explaining the reasons for changes in premiums.* Another key theme from employer consultations was that employers would like more information explaining the key drivers of premium change.

Recommendation 4: *Retain the current approach to capping the costs of individual claims, but increase the transparency of the process by publishing details of the dollar amounts used to cap claims.* Although the claim cap used by Comcare is relatively high compared to other state schemes, there is strong evidence to suggest that lowering the cap further would introduce additional cross-subsidies.

Recommendation 5: *Consider limits on year on year premium movements.* We recommend restricting such limits to premium movements driven by individual employer claim performance. We do not recommend limiting premium movements due to changes in the level of the overall premium pool. The motivation for these limits was to prevent disruptive instability in premium rates.

Recommendation 6: *Investigate whether the administrative expenses included in the premium pool can reasonably be divided into:*

- *Those relating to claims management and which are reasonably allocated to employers in proportion to expected future claims costs*
- *Those relating to other functions which are reasonably allocated to employers in proportion to wages.*

Some employers in the Comcare scheme have very low premium rates and this recommendation is to ensure that all employers are contributing an appropriate share of the fixed costs of the scheme.

Recommendation 7: *Retain the current bonus/penalty system with some modifications to increase transparency and the incentive effect.* Employer consultations revealed that there was a general acceptance amongst employers that the current bonus/penalty arrangements are a reasonable approach to increasing the price signal in premiums.

Recommendation 8: *Maintain the current approach for dealing with Machinery of Government (MOG) changes.* The current approach to dealing with MOG changes is appropriate. Attempts to simplify the current approach risk removing the financial incentive to invest in the rehabilitation outcomes of transferred claimants and this has the potential to result in poorer outcomes for injured employees.

Section 5 of the report contains a discussion of some further issues for consideration in addition to our key recommendations.

1 INTRODUCTION

1.1 Purpose of this report

Under the Safety, Rehabilitation and Compensation Act 1988 ('SRC Act') Comcare is required to determine the premiums each Entity and Commonwealth Authority covered by the Comcare scheme ('employers') must pay each financial year. Comcare has engaged the actuarial consultancy Taylor Fry to undertake an independent review of Comcare's premium setting process. This report documents the results of this review.

The main purpose of the review is to:

- Assess the effectiveness of premiums in providing a direct financial inducement to each employer to reduce workers' compensation costs through improved safety and rehabilitation measures.
- Recommend changes to the premium setting process so that premiums are more effective at inducing employers to reduce workers' compensation costs.

In other words, the key purpose of this review is to assess and improve the effectiveness of premiums as a 'price signal' to reduce costs. A more effective price signal has a number of potential longer-term benefits, including:

- Safer workplaces for employees and enhanced rehabilitation processes for injured workers
- Lower premiums for employers
- Lower workers' compensation costs for the Commonwealth government
- An improved funding ratio for Comcare and a reduction in the size of the additional margin that is currently included in premiums to restore Comcare to a fully funded position.

1.2 Previous reviews

The most recent review of Comcare's premium setting process was in 2003 by David Young of Young Actuarial Software & Services. The scope of that review was to consider certain aspects of the actuarial model used to allocate premiums to employers. The results of that review were summarised in the letter *Review of Comcare Australia premium allocation model*, dated 23 November 2003.

There have been a number of changes in the Comcare scheme in recent years which have motivated the need for another review. These include:

- **Large increases in Comcare premiums over recent years.** These premium increases have increased pressure on employer budgets. Low investment returns, the erosion of the initial financial benefits of the 2007 SRC Amendment Act, along with revised actuarial estimates for long-term claimants, have all contributed to these increases. In response to these increases, Comcare has introduced a number of new claims management processes, including the Active Management Model.

These are showing signs of improving scheme costs with the 2015/16 premium year showing the first reduction in the aggregate Commonwealth premium pool since 2010/11. This premium review, with its focus on improving the effectiveness of premiums as a price signal, is another avenue Comcare is investigating to bring down costs.

- A **significant change in the mix of claims.** For the 2015/16 financial injury year it is forecast that there will be less than half the number of accepted claims compared to 2002/03 but that the 2015/16 claims will have an average cost more than double the 2002/03 claims. In other words, the mix of claims in the scheme has moved to a smaller number of higher cost claims. Another change is that a larger proportion of claims are now for psychological injury. In the 2002/03 injury year about 12% of claims were due to psychological injury. In 2015/16 the percentage is expected to be 24%. Comcare's premium model was last calibrated following the 2003 review and the changes in the mix of claims since that time suggest a model review is warranted.

- **Feedback from employers to Comcare highlighting a lack of transparency in the current premium setting model.** In particular, a number of employers have noted that the current premium setting process does not contain a clear and easily understood link between an employer's recent claim experience and the premiums they are charged. Comcare has expressed concern that the lack of transparency may reduce the effectiveness of premiums as a price signal.

1.3 Scope of this review

The scope of this review was defined in the *Statement of Work* accompanying Comcare's *Request for quotation 15/390*. In summary the main aim of the review is to assess the effectiveness of Comcare's existing premium model in providing appropriate price signals and to identify improvements which would increase the premium model's effectiveness. In assessing effectiveness, the review is to take into account the views of key stakeholders including employers, the Safety, Rehabilitation and Compensation Commission (the Commission) and Comcare. In addition, the review is to focus on how the premium pool for Commonwealth agencies is allocated to individual employers and not on how the overall premium pool is estimated. This review does not cover Comcare's funding policy and the additional margin component of premiums charged by Comcare in recent years.

In particular, the scope of the review includes the following items reproduced from the *Statement of Work:*

Premium setting framework:

- The Commission's guidelines for Comcare's determination of premiums
- Comcare's premium determination framework documentation
- The timing of the current premium setting processes
- The information provided to employers in support of the premium
- The reporting framework to monitor premium outcomes across the scheme and assess their effectiveness in providing a direct financial inducement to reduce workers' compensation costs.

Premium setting process:

- The type of employer data used to calculate premiums
- Whether Comcare should continue to use statistical case estimates or use some other method to estimate premium payer future costs
- The injury period used in the premium allocation model
- The trade-off between stability in premiums and responsiveness to changes in claims experience across small, medium and large employers (including the suitability of limits on percentage change in premium rates per year)
- Appropriate methodologies and variables for determining credibility of individual employer experience
- Appropriate mechanisms to maximise employer engagement and incentives to improve claim outcomes (including adjustment of prior year premiums)
- Policies for adjusting premiums for employers affected by transfers of functions due to Machinery of Government changes
- Appropriate methodologies for the allocation of fixed costs
- The premium model formulae and variables
- Detailed specification of any proposed model changes or new model.

The scope of the review specifically excludes:

- Proposed changes to the SRC Act
- Review of the processes used to determine the overall premium 'pool'
- Review of the case estimate methodology
- Review of the software used to calculate premiums or case estimates
- Implementation of any proposed model changes or new model.

1.4 Structure of this report

This report contains four main sections:

- **Section 2: Comcare's premium setting framework and model** – describes the legislative and regulatory framework in which premiums are set and the actuarial model that Comcare uses to set premiums.
- **Section 3: Employer views on the current premiums setting model** – summarises the key themes that emerged from our consultations with selected employers on the adequacy of the current premium setting process.
- **Section 4: Key recommendations** – presents our key recommendations and the rationale for them.
- **Section 5**: **Additional issues for consideration** – contains a discussion of some further issues for consideration.

2 COMCARE'S PREMIUM SETTING FRAMEWORK AND MODEL

2.1 Legislative requirements

Under the SRC Act Comcare pays workers' compensation benefits for work related injuries and diseases. Comcare funds the claim payments and associated administrative expenses through the collection of annual premiums from employers.

The SRC Act sets out a number of requirements for Comcare when determining annual premiums. In particular:

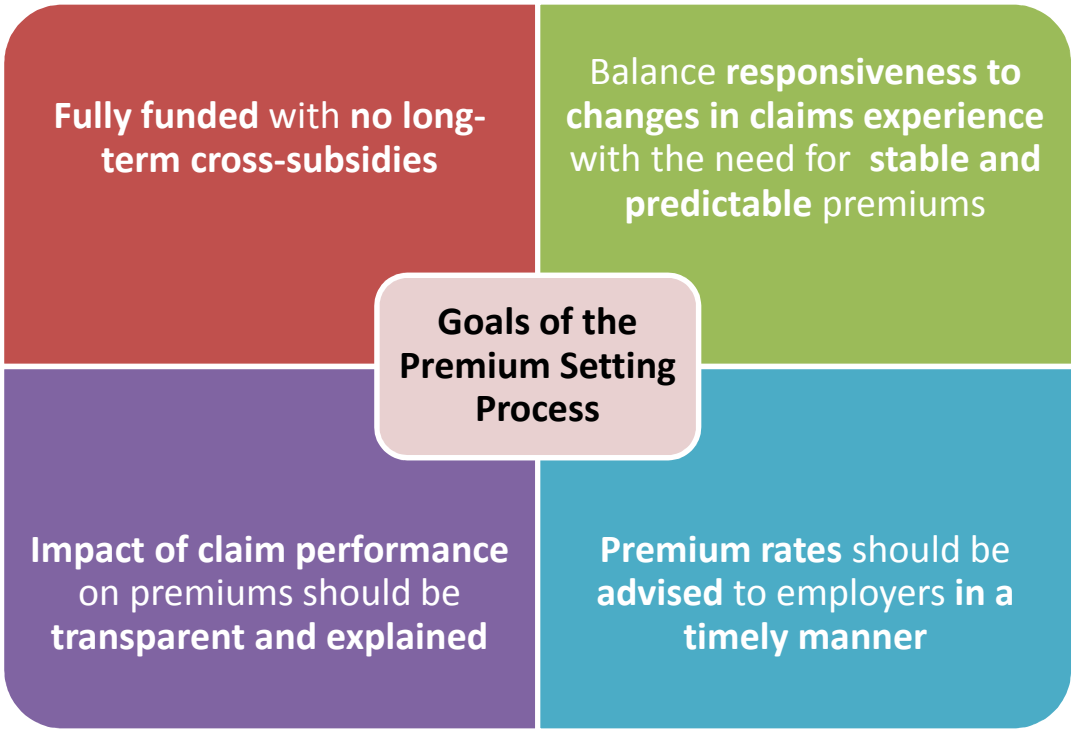
- Section 97A requires Comcare to set a premium for each entity each financial year that includes:
  - A **Prescribed Amount** that is Comcare's estimate of its liability for injuries expected to be incurred by the employer in that financial year including an allowance for the cost of managing those claims.
  - A **Bonus or Penalty** amount that is an appropriate amount having regard to the past claims from the employer.
- Section 97E requires that premiums comply with the guidelines issued by the Commission to the CEO of Comcare. The current guidelines are discussed in Section 2.2.
- Section 73 provides that the Minister for Employment may give direction to Comcare about the performance of its functions and the exercise of its powers. The Minister has not given any directions in relation to the setting of premiums at this time.

2.2 The Commission's Premium Determination Guidelines

2.2.1 The four performance goals described in the guidelines

The current *Premium Determination Guidelines* were issued by the Commission on 3 December 2013. The guidelines can be summarised in terms of the four core performance goals shown in the following diagram.

Figure 2.1 **The four performance goals of the Commission's Premium Determination Guidelines**



These performance requirements are discussed below.

Premiums to be set on a fully funded basis with no significant long-term cross-subsidies between employers

In the context of employer premium allocation, which is the focus of the current review, this requirement means that:

- The total of all employer premiums must equal the total premium pool for Commonwealth agencies
- The Prescribed Amount component of an employer's premium should, in general, be sufficient to cover all expected future costs from claims arising from injuries and diseases sustained in the premium year, including related claims management costs. Short-term departures from this requirement are acceptable if the departure is the result of meeting one of the other performance goals.

There are two key rationales for the latter performance goal – improving the price signal effect and equity. The latter performance goal improves the price signal effect by passing on the full financial impact of improvements or deteriorations in an employer's claims performance as soon as practical. For example, an improvement in rehabilitation outcomes will reduce claims costs from an injury many years into the future. For premiums to act as an effective price signal, the full financial impact of this improvement (as far as can be measured) should carry through to premiums.

This performance goal also acts to improve equity by assigning the financial benefits of improvements in claims experience to the employer responsible for the improvements (and vice versa).

The tolerance of short-term cross-subsidies in this goal is an acknowledgement of the fact that, in the short-term, it may be impossible to meet both the goal of no cross-subsidies and the other goals of the premiums setting process. For example, the goals of no cross-subsidies and stable and predictable premiums can come into conflict when an agency experiences a sudden and dramatic change in claims performance. In such a case it may be impossible to remove cross-subsidies fully and immediately without a sudden and large change in premium.

Premium rates should provide an appropriate balance between responsiveness and stability

This goal recognises the need to find an appropriate balance between:

- The need for premiums to respond adequately to deteriorations or improvements in claim performance so they act as a price signal
- The desire of employers to receive stable and predictable premiums to assist with their budgeting processes and to avoid disruptive instability in premiums (referred to as 'rate shock' in the guidelines).

The balance is an important one to get right. If premiums are overly stable then they will respond slowly to deterioration in an employer's safety and rehabilitation measures. In this case the immediate financial consequence of deterioration will be small and, by the time the full financial impact of the deterioration is felt by an employer, the poor practices may have become entrenched. Alternatively, if employers are not rewarded in a timely manner with lower premiums for genuine improvements in their safety and rehabilitation measures, the incentives to maintain those improvements will be lessened.

The impact of claim performance on premiums should be transparent and explained

The goal here is to ensure that there is a clear and well understood link between an employer's recent claims experience and changes in premiums. In other words, if an employer has demonstrated improved claim performance there should be an identifiable decrease in the relevant component of premiums and vice versa. The rationale for this goal is that, if the connection between past claims experience and future premiums is not clear and/or not well understood, then employers are likely to feel they have less control over their future premiums and are less likely to invest in safety and rehabilitation.

Premium rates should be advised to employers in a timely manner

It is important that indicative premiums are advised to employers in a timely manner to assist with their budgeting processes for the following financial year.

2.2.2 Commentary on the four performance goals

The four performance goals contained in the Commission's *Premium Determination Guidelines* are both reasonable and unremarkable in the sense that they are common to most workers' compensation schemes in Australia.

If there is a shortcoming of the guidelines it is in the lack of tightness of the language used to describe the performance goals. The guidelines describe the goals in very general language allowing for a wide variety of interpretations. For example in relation to premium stability the guidelines require that it should be both sufficient to avoid "rate shock" (which is not defined) while balancing the need for responsiveness.

A potential advantage of this general language is that it allows Comcare and the Commission considerable leeway in determining the optimal balance between the competing goals – by not being too prescriptive there is flexibility to choose the right balance for the circumstances. However a potential disadvantage is that it is not clear to premium payers when a guideline has been breached. This may create unnecessary premium appeals or frustration that the guidelines are too loose to be effective.

The recommendations that we have made in Section 4 are all consistent with the current *Premium Determination Guidelines.* Section 4 of this report contains some concepts that could be used to make the performance guidelines more explicit, although this topic is not discussed explicitly in this review.

2.2.3 Additional guidelines

In addition to the four performance guidelines discussed above, the Commission's guidelines list additional items which can be considered procedural. The procedural items include:

- Comcare will report to the Commission each year on the performance of the premium model
- Comcare will seek the Commission's endorsement for any changes to the premium model and any significant changes will be explained to employers
- The methodology used for calculation of premiums in one year should be used to calculate penalty and bonus amounts in the following year (regardless of whether the methodology has been varied in the interim).
- Adjustments to premiums due to the correction of data errors should only be made if identified before the finalisation of the charge to which they relate.

These procedural items are not considered (in any detail) in this review because they do not affect the performance assessment of alternative premium models.

2.3 Comcare's premium setting model

2.3.1 Introduction

Sections 2.1 and 2.2 above discussed the legislative and regulatory framework in which Comcare must set employer premiums. Of particular importance are the performance goals that are outlined in the Commission's *Premium Determination Guidelines.*

To set premiums Comcare uses a premium setting model. This is an actuarial model calibrated to give a particular balance between the competing goals of the premium setting process.

Comcare's current premium setting model has been in use since the mid-1990s. It was last calibrated in 2003 during the 2003 premium review.

2.3.2 Features of the Comcare premium setting model

The technical details of Comcare's premium model are set out in Appendix A. In this section we highlight the main features of the model.

A two-step process – premium pool estimation followed by employer allocation

A feature of Comcare's premium setting process that is common to several workers' compensation schemes in Australia is that it is a two-step process. The Comcare document *Framework for setting premiums 2015/16* sets out the detail of the two-step process. The process starts with an estimate of the Commonwealth Premium Pool which is the total amount of premium required to be collected from Commonwealth agencies. Once the pool is known the second step of the process is the allocation of this pool to individual employers. This two-step process ensures that the goal of fully funded premiums required by the *Premium Determination Guidelines* is achieved.

The consequence of the two-step process is that changes in employer premiums from year to year need to be understood in terms of these two steps. In general the change in an employer's premium over the year is due to a combination of:

- Changes in the overall premium pool referred to as **pool trends**
- Changes in **individual employer claim performance** relative to other employers.

The term relative in the last dot point is important because it is the relative performance which affects the allocation of the premium pool. If an employer's claim performance improves, but that improvement is less than the average improvement of all Commonwealth employers, then they will end up with a greater share of the premium pool.

The two-step process can result in counter-intuitive premium changes if one considers individual employer claim performance in isolation. It is possible for an employer to have improved relative claims performance over the year but to still see their premiums rise because of adverse pool trends. This could occur if the adverse pool trends were driven by longer duration claims outside of the responsibility period used to assess claims performance (see below).

Evolutionary credibility model

Two of the main goals of the premium setting process are:

- To balance responsiveness to changes in claims experience with the need for stable and predictable premiums
- To avoid long-term cross-subsidies.

To help meet these aims it is usual to think of an employer's actual claims cost for an injury year to be due to:

- An underlying (but unknown) 'true' component, and
- A random or chance component.

The 'true' component is essentially what would be measured if we were to average the claims cost of an employer over many years in a stable claims environment. The random or chance component is what causes the actual cost in any one year to depart from this average. The departures are caused by chance or randomness in the processes involved in injury and return to work.

If Comcare were to fully meet the aim of no cross-subsidies, the premium model would aim to set the claims cost component of the Prescribed Amount for each employer to be equal to the 'true' component of the expected claims cost for the employer in the premium year.

There are a number of difficulties in estimating expected 'true' claims cost. The main one is that for most employers it is not stable over time. Work culture, legislation and investments in safety and rehabilitation can all change over time, causing changes in the 'true' claims cost.

Without the complication of a varying 'true' claims cost, a reasonable estimate of the 'true' claims cost could be obtained by averaging claims costs for an employer over many past injury years – the averaging process reducing the impact of the chance component.

With the complication of a varying 'true' claims cost more sophisticated approaches are needed. In general there are two alternative approaches used in Australian workers' compensation schemes to deal with this complication:

- **Evolutionary credibility** – this method still uses an employer average over several past injury years. However, greater weight is given to more recent injury years in the average to recognise that the more recent years should be closer to the current 'true' claims cost.
- **Hierarchical credibility** – this method averages only over the more recent (and relevant) injury years but reduces the impact of the chance component by grouping the claims experience of the employer with other similar employers. This method relies on the fact that the impact of the chance component on an average is reduced the greater the volume of claims experience used in the average.

Each of these methods has its advantages and disadvantages and these are discussed further in Section 5.1.1. **Comcare's current premium model uses an evolutionary credibility approach.** As discussed in the 2003 premium review, one of the reasons the evolutionary approach was used was because it does not require the classification of

employers into groups of similar employers (risk groups). Risk groups are not currently available for Comcare employers and the grouping systems used in the state schemes are not appropriate. The state scheme systems would classify the vast majority of Comcare employers into a single industry group, white collar clerical.

A feature of all evolutionary credibility approaches is that greater weight is given to the claim performance for more recent years. The greater the weights for more recent years, the greater is the model's responsiveness to recent claims performance. The weightings are controlled by the '**credibility factor**'.

In general credibility factors are chosen to achieve an appropriate balance between the different goals of the premium setting process. A small credibility factor will give less weight to more recent experience and result in a less responsive but more stable premium setting process. A large credibility factor will give a more responsive premium setting process. Within this range there is also a credibility factor which is considered optimal for giving the best estimate of the 'true' claims cost. If a best estimate credibility factor is used then the model will be optimal for minimising cross-subsidies.

In the past we understand that the credibility factors used in Comcare's premium setting model have been chosen to give the desired balance between responsiveness and stability.

An important feature of Comcare's credibility factors is that they decrease (in general) as the payroll of the employer decreases. A consequence of this is that the responsiveness of the premium setting model to claim performance is less for small employers. This is an unavoidable consequence of the random component of claims experience being larger for small employers. This is illustrated by the observation that many small employers go for several years without having a claim.

Two measures of claims experience used – claim frequency and average claim size

When discussing claims experience (or performance) in the previous sub-section the measure of claims experience used was claims cost. However, the Comcare premium model breaks claim cost into two components, claim frequency and average claim size. Separate evolutionary credibility models are used for each component. The rationale for separating cost into its components is that, in theory, this approach will result in better estimates of the 'true' claims cost. This is because the frequency component has a much smaller random or chance component than the average claim size and, if they are modelled together, some of the information contained in historical frequency changes is lost.

However, the downside of treating them separately is that the model can appear overly responsive to small claims. This is illustrated in the following figure.

Figure 2.2 **Change in the premium rate for an actual employer with a 2015/16 pay roll of approximately $20M when Comcare's current premium model is back-tested on historical claims and wages data (See Appendix C)**

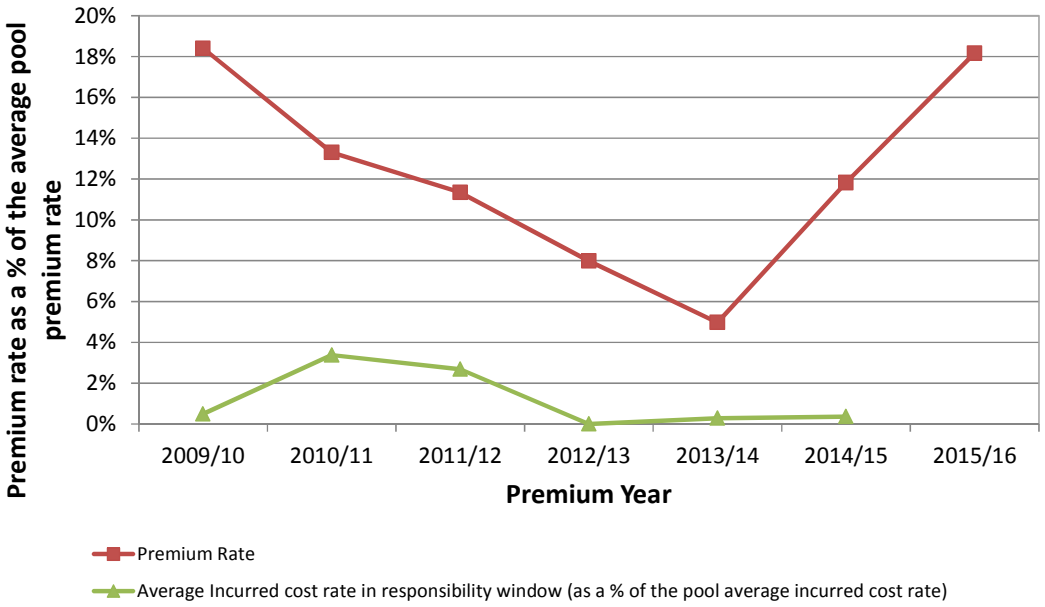


Figure 2.2 shows a declining premium rate for this employer up until the 2013/14 year (ignoring pool trends). The decline is due to claims cost experience less than that assumed when setting the premium. For example, the premium rate for the 2012/13 year was assumed to be 8% of the average pool premium. However the total life time cost of accepted claims (the reported incurred cost) in the four year responsibility period up to 2012/13 (to December 2012 to be precise) was zero. In response the premium for 2013/14 was reduced.

In 2013/14 there was one claim accepted with a very small (relative to scheme average) lifetime cost estimate. The cost of this claim was less than anticipated when setting the 2013/14 premium. Even so, the premium model increased the premium, treating this small claim as though it had a cost very close to scheme average. The same thing happened again in 2014/15 causing a further increase in premium for 2015/16.

The claim frequency measure used in Comcare's premium model is the ultimate number of claims expected to be accepted in an injury year per million dollars of wages. The ultimate number of claims is the sum of those accepted to date plus those that will be accepted in the future. The number of future claims is estimated as a proportion of claims accepted to date. The proportion is assumed to be constant across all employers but gets smaller as an injury year ages. The underlying assumption here is that the pattern of claims acceptance over time is similar across all employers.

The average claim size measure is an estimate of the average size of all claims expected to be accepted for a given injury year. It is based on the average expected lifetime cost for all accepted claims to date which in turn relies on actual payments to date plus an estimate of outstanding payments from Comcare's **statistical case estimate model**. A key assumption here is that claims which are yet to be accepted will have the same average cost as accepted claims.

Four year 'responsibility window'

In our earlier discussion of Comcare's evolutionary credibility model, we characterised the model as making an estimate of the 'true' claims cost in the premium year by taking a weighted average of the claim costs over several past injury years.

A complication in this process is that the claim costs for past injury years are estimates also. The claims costs for an injury year are the total amount of benefits expected to be paid for all claims incurred in that year. At the time of premium setting many of these costs will have not been paid. In general, less than half of the total costs for a given injury year have been paid four years after the completion of the injury year. Comcare uses a statistical case estimate model to forecast expected outstanding payments for each accepted claim.

Each time premiums are set for the coming financial year it would be possible for Comcare to re-estimate claims costs for all past injury years. The re-estimates would be more accurate because:

- With the passage of a year between premium determinations, the proportion of outstanding payments has reduced
- The revised estimates take into account improvements or deteriorations in claims over the year.

However for reasons of pragmatism, Comcare only re-estimates the costs of the four most recently completed injury years.

A consequence of this is the creation of a four year responsibility window. Only changes to claims experience in the four most recently completed injury years can influence premiums for the coming financial year.

The pragmatic reasons influencing the decision to use a four year window include:

- A longer window would make keeping track of historical customer transfers and changes resulting from Machinery of Government changes more difficult.
- Because the current model is responsive to recent experience, the injury years outside of the window have a small impact on premiums, particularly for medium to large employers.

The link between recent claim performance and premium changes is complex

An outcome of the model features described above is that the link between an employer's recent claim performance and premium changes is complex. From an employer's perspective, the link between recent claims experience and changes in premium is not transparent. There are three main features that cause this complexity.

The first feature is the use of a premium model which discards the previous premium estimate when determining the coming year's premium. By discarding the previous estimate the direct link between recent claims performance and the change in premium is lost. There are sound statistical reasons for discarding the previous premium estimate, but this comes at a cost of less transparency. The model does retain a direct link to a past premium estimate – that set in the previous premium setting process for the financial year four years earlier – but that premium has no direct relevance to premium payers.

The second feature is the use of separate frequency and average size components in the model. In itself this feature only adds marginally to the difficulty in understanding the link between experience and premium changes. But when compounded with the first feature it adds considerably to the model's complexity.

The final feature relates to presentation. As noted above, premium estimation is a two-step process with premium pool estimation followed by employer allocation. The current premium setting process does not clearly separate these two processes, which makes an attribution of the reasons for change more difficult.

Claim capping

Claim experience capping is another important feature of Comcare's premium model. Claim capping involves capping the total amount of lifetime cost attributed to any one claim when assessing claim performance in past injury years. To cap claims a dollar amount is set for each past injury year above which claims costs are capped. The dollar amount is set so that the total value of costs of individual claims in excess of the cap equals 5% of total costs for the injury year. This results in a high dollar cap when compared to other schemes that affects less than 2% of claims. The costs of individual claims in excess of the cap are redistributed across all claims in proportion to the amount of capped cost.

Bonus/penalty amount

For each premium year Comcare calculates an initial and final premium. The initial premium – the Prescribed Amount – is calculated prior to the beginning of the premium year. A final premium (ignoring wage roll revisions) is then calculated one year later near the end of the premium year. This final premium takes the form of a premium adjustment to the initial premium. The adjustment is called a bonus if it reduces the initial premium and a penalty if it increases the initial premium.

There are two rationales for including a bonus/penalty adjustment. The first, and perhaps most important, relates to enhancing the financial incentives to invest in safety and rehabilitation (the incentive rationale). The incentive is created by reducing/increasing premiums in response to improvements/deteriorations in an employer's claims experience during the premium year.

The second relates to the model being able to give more accurate estimates of the 'true' premium when an additional year of information is used in the model (the accuracy rationale).

In calculating the bonus/penalty amount the current premium model does not take into account any experience development in the premium injury year itself. It is arguable that the incentive effect would be increased if it did. For example, when calculating both the Prescribed Amount and the bonus/penalty adjustment for the 2015/16 premium year the calculations rely on claims experience in the calendar injury years up to 31 December 2014 only. The main difference between the Prescribed Amount calculation and the bonus/penalty calculation is that the bonus/penalty calculation is carried out one year later and includes one further year of claims development in the injury years up to 31 December 2014.

In addition, the bonus/penalty amount does not take into account any movements in the estimate of the premium pool for the financial year. The accuracy of the bonus/penalty

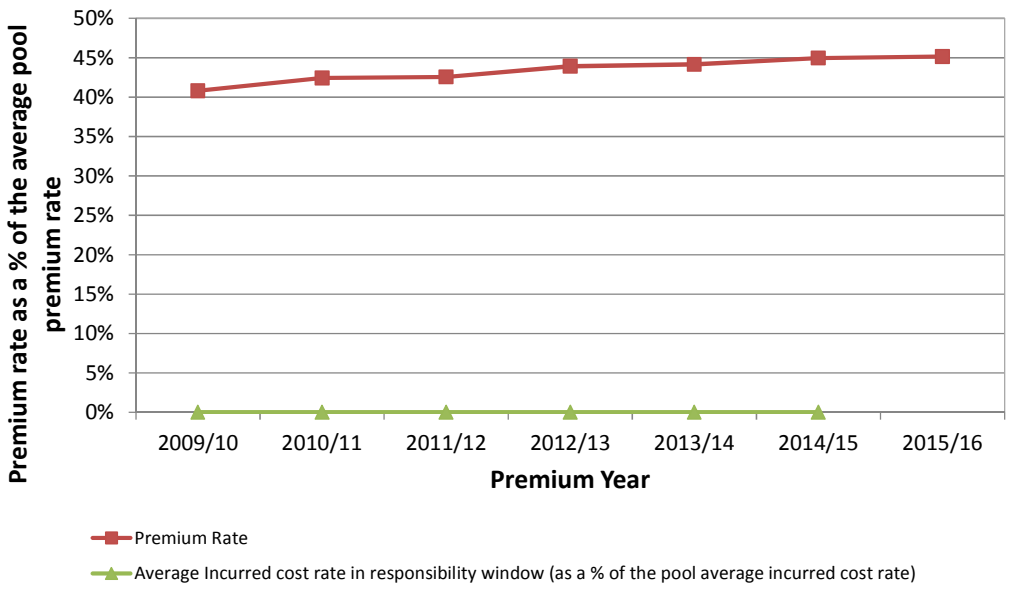
amount would be improved if it did. Improved accuracy could reduce the need for future deficit reduction levies to fund premium short-falls.

A hybrid evolutionary/hierarchical credibility approach used for small employers

For most employers the Comcare premium model uses a 'pure' evolutionary credibility approach for estimating premiums. However, for very small employers – those with a payroll estimate less than $0.8M – the premium model uses a hybrid approach (this currently affects 12 employers in the Commonwealth scheme). What this means is that, instead of using only the employer's own experience to determine its share of the pool premium, it uses a weighted average of the employer's own experience **and** the overall pool experience. In effect, the employer's experience is partially pooled with the experience of the Commonwealth pool.

A consequence of this is that very small employers with a current premium rate well below the pool average will, ignoring pool trends, see increases in their premiums from year to year even if they have had no claims. This is illustrated in the following figure.

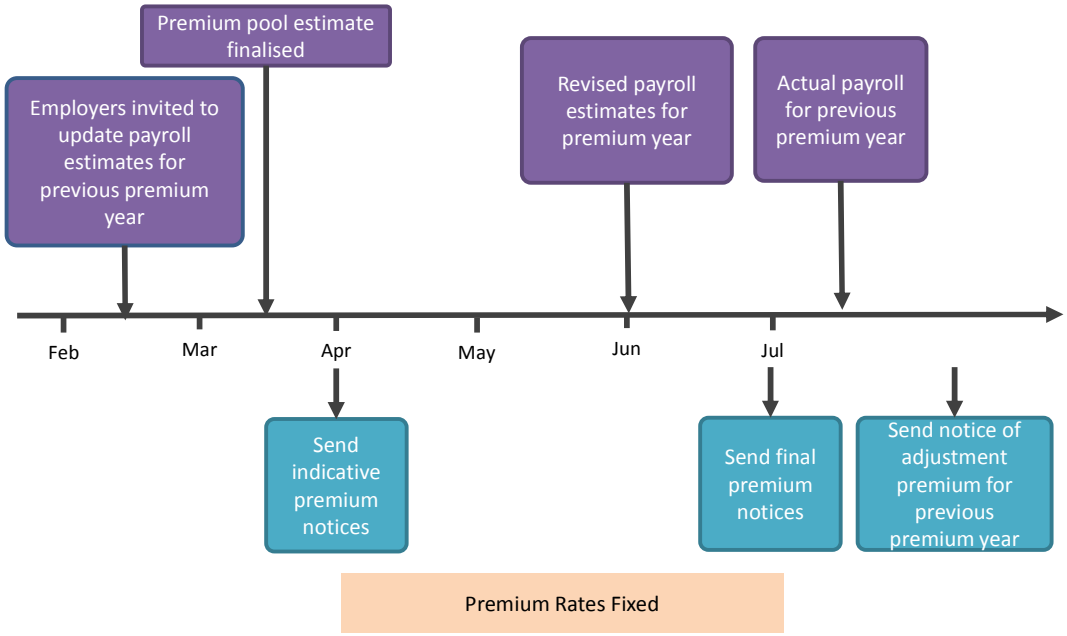
Figure 2.3 **Change in the premium rate for an actual employer with a 2015/16 pay roll of around $0.5M when Comcare's current premium model is back-tested on historical claims and wages data (See Appendix C)**



Timing

The premium setting process requires a number of key inputs which are shown in the following diagram. The time of availability of those key inputs affects the timing of the premium notices sent to employers.

Figure 2.4 **Timing of key inputs and outputs of the premium setting process**



Employers receive notice of their indicative premium amounts in April. Those initial premiums are considered indicative in the sense that the payroll estimates used to calculate them are based on the previous premium year's payroll figures and are indicative only. Premiums are revised once firmer estimates of payroll amounts are received around June. The revised final premiums are notified to employers on 1 July. The only thing that changes between the initial and final premiums are estimates of wages. The premium rate, that is the premium per million dollars of wages, remains fixed.

Actual payroll figures for a premium year are only known once the premium year is complete. When actual payroll figures are known an adjustment premium is calculated for the relevant premium year based on the actual payroll figures.

The premium setting process uses claims data available six months prior to the start of the new premium year. If indicative premium notices were to be sent earlier than April then they would need to be based on data more than six months prior to the start of the premium year. This would come at the cost of less accurate premium pool estimates and a less recent responsibility window. The current timing seems a reasonable balance between using up-to-date information and providing timely notification to employers.

3 EMPLOYER VIEWS ON THE CURRENT PREMIUM MODEL

3.1 Introduction

For the premium review, Comcare requested that we consult with a number of premium paying agencies to seek feedback on the strengths and the weaknesses of the current premium setting model. Our focus in these consultations was to:

- Identify common themes in employers' reactions to Comcare's premium setting model.
- Seek suggestions for improvements to the process.

Individual consultations were held in Canberra with representatives of the five largest employers:

- Department of Human Services
- Department of Defence
- Australian Taxation Office
- Department of Immigration and Border Protection
- Australian Federal Police

We also met with the Department of Employment to seek feedback from them as both a premium payer and as the Department responsible for workers' compensation policy.

In addition, a workshop was held for representatives from smaller and medium sized agencies. Representatives from 20 smaller to medium sized agencies were invited to the workshop by Comcare. It was attended by representatives from four agencies:

- Airservices Australia
- NBN co
- Office of the Official Secretary to the Governor-General
- Department of Education and Training.

The Department of Social Services, which was unable to attend, sent responses by email.

3.2 Summary of findings

The key findings from the employer consultations are reported below. The findings are intended to reflect the common themes amongst a wide range of viewpoints. They are not intended to be a comprehensive summary of the results of each individual consultation.

Issue	Comments
1. Lack of faith in Comcare's SCE model	Comcare uses a statistical case estimate (SCE) model to estimate the outstanding lifetime cost of accepted claims. As discussed in Section 2.3.2, the lifetime cost of claims is used to measure an employer's claim performance. In general, the employer consultations revealed a lack of faith in the SCE model. There were three main reasons for this lack of faith: ●The SCE was seen as slow to respond to changes in a claimant's work status or outlook. It was remarked by many that SCE estimates remain high for several months after a claimant has returned to work. ●SCE estimates seemed high (biased) relative to the claims managers' expectations for the claim. ●The SCE model is essentially a "black box" which makes it difficult to understand why a particular estimate has been assigned to a case. The lack of faith was particularly acute for smaller employers because under the current premium model a single claim can cause a large increase in premiums. The outstanding lifetime cost ascribed to an **individual** claim in these circumstances gains particular importance. Despite this lack of faith in the SCE model, employers did not express a desire to use a more transparent measure of claim performance such as paid claims costs. The reason for this is the risk that, by ignoring the outstanding costs of a claim, cross-subsidies may be introduced into premium rates. By using paid claims only to measure claim performance, an employer with a higher proportion of more severe, long-duration claims would be subsidised by other employers. Some employers noted that manual case estimates were both more responsive to changes in a claimant's outlook and were more transparent than the SCE. However, others noted that if manual case estimates were set by the individual employers and if these were used in premium setting, there would be a conflict of interest – deliberate underestimation of case estimates would reduce the employer's premiums.
2. The link between claims experience and changes in premiums is not transparent	While a number of employers understood the link between claims experience and premiums at a high level, they felt there was insufficient detail in the supporting material to understand or reproduce the link. This made it difficult for employers to understand the reasons for the changes in their premiums and to explain those changes to management. In addition, employers found it difficult to get adequate

Issue	Comments
	explanations from Comcare on how changes in claims experience had impacted their premiums. It was also noted that, because the claims experience measures used in premium setting included an amount for claims yet to be reported or accepted, it was harder to reconcile these measures to their own claims history.
3. The four year responsibility window is considered appropriate	There was a general acknowledgement that there needed to be a balance between: ●Giving more weight to recent experience so that premiums were responsive to changes in claim performance, and ●Giving incentives to manage longer duration claims. The four year responsibility window was considered, in general, to be a reasonable balance. There was a desire amongst some large agencies for more weight given to recent experience, however the actual weight given to their recent experience was not transparent to them. Some smaller employers commented that their premium rates were quick to respond to poor experience but were slow to respond to good experience (the reasons for this are discussed in Section 5.1.1).
4. The current claim capping process did not generate major concerns	There was a general view that: ●Claims capping was necessary to protect smaller employers from disruptive instability in premiums caused by large claims, however ●It is desirable that the capping process should not introduce large cross-subsidies. If large claims are more concentrated in some employers, then the lower the claims cap the greater the potential for capping to introduce or increase cross-subsidies in premiums. It was noted that the dollar values at which claims are capped are not published by Comcare and that for transparency it would be desirable if they were.
5. Most agencies were comfortable with the current bonus/penalty arrangements	There was a general acceptance that the current bonus/penalty arrangements were a reasonable approach to increasing the price signal in premiums.

Issue	Comments
	Although the bonus/penalty arrangements increase premium uncertainty for budgeting purposes, no employers expressed a desire to remove these arrangements. For some employers, the terms bonus/penalty were seen as unhelpful and they would prefer that a more descriptive label be used such as "reassessment of prior year's premium". We were asked by Comcare to canvas the possibility of moving to an arrangement under which, for each premium year, hindsight adjustments of employers' premiums would continue for several years after that premium year (see Section 4.7.1 for a description). In general employers were ambivalent to these types of arrangements. While there was an acknowledgement that they could increase incentives to invest in safety and rehabilitation, there was a belief that Machinery of Government changes could make these arrangements complex and unmanageable (see Issue 8 below for more discussion on Machinery of Government changes).
6. The PQRS should contain a narrative explaining the key reasons for change	The Premium Quick Reference Sheet (PQRS) is provided with the premium notice letters sent to agencies and explains the technical details of each employer's premium. A number of agencies noted that this year's PQRS was an improvement over previous years, but would like it to contain more explanatory material including a narrative explaining the reasons for change in the employer's premium rate. Related to this was a desire by some agencies to clearly identify those causes of change which were outside of the agency's direct control and those for which the agency had some influence. The current premium notice contains a number of separate items: the Prescribed Amount, the bonus/penalty amount and the additional deficit reduction margin. One agency commented that they would prefer these items to be invoiced separately as the rationale and drivers of each items were distinct. However the requirements of Section 97A of the SRC Act may mean this is not possible.
7. The timing of initial and final premium notifications were satisfactory for most employers	Most agencies thought that the timing of initial and final premium notifications were satisfactory. However, a couple of agencies noted that it would have been helpful to have initial premium estimates by February so that they could be taken into account for the Supplementary

Issue	Comments
	estimates in the May Budget. Agencies have the right to have their premium determination reviewed and a number of agencies were unhappy with the time taken for these reviews.
8. Machinery of Government changes were noted to be time consuming and costly to deal with	The restructuring of Government agencies is referred to as Machinery of Government changes. They were a source of frustration to many employers for two main reasons: ●The current approach to dealing with Machinery of Government changes requires that the claims and wages history for agencies affected by the changes be re-stated as if the new structure had existed throughout the responsibility window. This can be a time consuming and difficult thing to do because personnel changes and the boundaries of some roles/functions can be unclear. The difficulties are exacerbated when a particular work unit is subject to successive Machinery of Government changes. ●The premiums for employers can be adversely affected when an incoming unit has poor past claims experience. The affected employer can feel that they have had to 'wear' the claims experience of claims that they have had no responsibility for.
9. Rewards for meeting operational targets had a mixed response (particularly for claims outside the responsibility window).	Comcare's current premium model reduces the premiums of those employers who improve their claims experience in the four year responsibility window relative to other employers and it increases premiums for employers whose relative performance deteriorates. This creates an incentive to invest in accident prevention and the rehabilitation of those claims within the window. Under the Comcare scheme, employers still have responsibility for the rehabilitation of employees still receiving benefits outside of the four year window. However the current premium model does not directly incentivise employers to invest in the rehabilitation of these long-term claimants. One approach to creating incentives to manage long-term claims is to introduce operational targets in relation to these claims that, if met, would result in a premium discount. Such a suggestion had mixed responses amongst employers. Some thought that operational targets were a reasonable way to address this issue while others were sceptical that there was much that could be done for the rehabilitation of these long-term claimants.

Issue	Comments
	Where there was support for agency specific operational targets, this was subject to the proviso that the specification of measures to calculate performance must be reliable (or else agencies will lose faith) and be developed in consultation with agencies.
10. Comparative performance benchmarks can be used to incentivise improved performance	One agency noted that the price signal contained in premiums was not the only way to create incentives to improve safety and rehabilitation outcomes. They suggested that comparative performance benchmarks were another. Their suggestion was to publish performance league tables comparing the performance of agencies with similar workplace profiles. This would serve two purposes: to motivate poor performers to do better and to identify those who were doing things well so that their approaches could be emulated. It was suggested that the league tables should cover a wide range of performance statistics – not just premium rates. The motivation here is 'what is measured gets managed'.

4 RECOMMENDATIONS

4.1 Measure claims experience with reported incurred cost

Recommendation 1

Use reported incurred cost rather than estimated total lifetime cost as the basis for measuring an employer's past claim performance.

In the short term Comcare's statistical case estimate model (SCE) should be used to estimate the outstanding cost component of reported incurred costs. However, we recommend that the current SCE model be reviewed and its performance assessed against some simpler alternatives.

One of the main goals of Comcare's premium setting model is to produce employer premiums that are responsive to changes in the claim performance of the employer. To achieve this goal the current premium model uses estimated total lifetime cost for all claims in the four most recently completed injury years as a measure of claim performance.

The estimated total lifetime cost for an employer in an injury year consists of three components:

- The sum of claim payments to date on all accepted claims with a date of injury in the relevant injury year (the paid cost component).
- An estimate of the additional future lifetime payments expected to be made on those accepted claims (the outstanding cost or case estimate component).
- And estimate of the lifetime costs for those claims incurred in the injury year but not yet reported or accepted (the 'IBNR' component).

Only the first of these items is directly available from the employer's claims history. The other two components need to be estimated using actuarial models. The outstanding cost component is estimated with a statistical case estimate model (SCE). The IBNR component is estimated using IBNR factors from Comcare's outstanding claims valuation that is prepared by an independent actuary.

The need for these estimated components in the measure of claims experience contributed to the lack of transparency that was reported to us in the employer consultations (see issues 1 and 2 in Section 3.2).

Recommendation 1 suggests simplifying the claims experience measure by removing the IBNR component. Claims experience would instead be measured with the estimated lifetime cost for accepted claims only, ie the sum of the paid and outstanding costs on all accepted claims also termed reported incurred cost.

4.1.1 Discarding the IBNR component

We recommend discarding the IBNR component of the claims experience measure because:

- It has no effect on the estimated premiums
- It serves the make the link between observable claims experience and the claims experience measure used for premium setting less transparent.

The use of the IBNR component has no effect on estimated premiums because the same percentage IBNR loading is applied to all employers. Because the percentage loadings between employers are identical, they do not change the relative performance of employers. As discussed in Section 2.3.2, it is the relative performance of employers that determines their share of the premium pool.

The use of the IBNR component reduces transparency because it is a modelled rather than an observed component.

It is important to note that the IBNR component can only be discarded with no effects on premiums because the IBNR loading that is used is assumed to be identical across employers. In practice this may not be a sound assumption. For example, an employer with a higher proportion of psychological injury claims would be expected to have a larger IBNR component because psychological injury claims generally take longer to be reported and accepted. The use of identical IBNR loadings would introduce cross-subsidies in premiums in such cases.

In this review we have not investigated whether different IBNR factors for different employers are warranted. Our recommendation to discard the IBNR component has been motivated by a recognised need amongst stakeholders for a more transparent premium model. Any attempt to retain the IBNR component and introduce different IBNR factors for different employers, while potentially technically more correct, would add additional complexity to the premium model. Our current recommendation is consistent with the current assumption of assuming identical IBNR factors for all employers and is consistent with the approaches used by other Australian workers' compensation schemes.

4.1.2 Retaining the outstanding cost component

The employer consultations revealed that employers accepted the need to estimate the outstanding cost component of claims in order to avoid introducing cross-subsidies into the premium setting process. However, there was a general lack of faith in the SCE used for this purpose (refer issue 1 in Section 3.2). The advantages and disadvantages of alternative approaches to estimating the outstanding cost component are discussed in the next section.

4.1.3 Alternative approaches to estimating the outstanding cost component

The current approach – the SCE

The SCE is a statistical model that estimates the expected outstanding costs on accepted claims. The Comcare publication *Comcare Premiums: your guide for 2015-16* provides a concise description of the information the model uses to make estimates:

"At the time a claim is accepted, the estimate of lifetime cost is based on available claim information. This includes the injured employee's age, gender, normal weekly earnings, type of injury, and the delay between injury and claim acceptance. The estimate of lifetime cost at the time of acceptance can only reflect average outcomes of previous comparable claims.

Over time, additional information emerges and other factors taken into consideration include:

- *the injured employee's cumulative time off work and the pattern of time off work (number and length of periods off work)*
- *whether the injured employee is at work or off work, and how long that has been the case*
- *if the injured employee is on a graduated return to work program (including the number of hours spent at work each week)*
- *the injured employee's pattern of medical and rehabilitation costs*
- *whether a third party recovery action has been initiated, and the progress of that action"*

The main advantages of SCE are that they are an objective data driven approach. When correctly calibrated they have been shown to be more accurate than other approaches. One reason for their accuracy is that they deal objectively with events such as relapses for intermittent psychological injuries.

There are two main disadvantages of SCE. The first is that they are complicated models. Understanding why a particular outstanding cost estimate is associated with a particular case can be difficult. Because of their complexity they are essentially black boxes. Trust and confidence in the estimates of an SCE needs to be obtained by continual performance assessment. In other words, the black box can be trusted only if is continually monitored and demonstrated to work well.

The second is that they can be slow to respond to changes in the status of an injured employee. During the employer consultations many employers reported instances of case estimates remaining high for several months after an injured employee has returned to work.

The main cause of the slow response is an in-built three month lag in Comcare's SCE model. This in-built lag means that, for Comcare to make an estimate at 31 December, they need to wait until 31 March. The lag is required because of reporting and processing delays in the relevant claims history information.

A second cause of the apparently slow response is that an SCE will continue to estimate an outstanding cost for claims that are back at work to allow for possible future relapses. For

some types of claims the risk of relapse is relatively high and the outstanding estimate can remain seemingly high after a return to work.

Statistical case estimates are used for setting premiums in a number of workers compensation schemes including those operating in Victoria and New Zealand.

Manual case estimates

Manual case estimates are another approach to estimating the outstanding cost component. Manual case estimates are estimates made by a case manager or claims assessor. These estimates may be made based on the case manager's expectations or may be determined by following a detailed set of guidelines.

Manual case estimates play an important role in case management for many self-insurers and in some state workers' compensation schemes such as NSW. An advantage in this context is that they are very responsive to changes in the outlook for the claimant.

In the context of premium setting they have two main disadvantages. The first is that they tend to be overly responsive to changes in the outlook for an individual. It is not uncommon to assign zero cost for expected future time off work to an individual currently back at work who has a reasonable probability of a future relapse. This over-responsiveness is one of the reasons that, when they have been compared to statistical case estimates, manual case estimates have done a poorer job of predicting the cost outcomes for claims[1].

The second disadvantage is that, because manual case estimates are to some extent subjective, there is the potential for conflicts of interest to influence the estimates placed on particular cases. The potential for conflicts of interest is one reason why NSW WorkCover stopped using manual case estimates in 2015 for the experience rated component of its premium model. In NSW case estimates are set by the companies who are responsible for claims management in the scheme. Although these companies are independent from the employers they manage claims for, it is widely believed that some employers were effective in lobbying for reductions in estimates on their claims. If case estimates were set by the employers themselves, then the potential for conflicts of interest would be greater.

Simple allowances

Another alternative is to replace the complex statistical case estimate model with a simpler model. The goal here is to simplify the estimate model sufficiently so that the reasons for the estimates are very transparent. In its simplest form the model could consist of a table which provided outstanding cost estimates for each active (open) claim according to length of time since injury and whether the injury was for psychological injury or not. Such estimates would be directly available from Comcare's outstanding claims

[1] See Richard Brookes and Mitchell Prevett (2004) *Statistical Case Estimation – An Overview of the NSW WorkCover Model*, Xth Accident Compensation Seminar. See http://actuaries.asn.au/Library/Statistical_Brookes_Prevett_PPT.pdf

liability valuation. More complex models would also be possible and these could be constructed using the outputs from the SCE or a similar model.

The advantage of these models is transparency. The disadvantage is that estimates are much less responsive to the particular circumstances of the claim.

If implementing a simplified approach, particular care would need to be taken with developing an appropriate definition of 'active' or 'open' claim. For example, for some purposes Comcare currently defines an active claim to be a claim that received a payment from Comcare in the last quarter. Such definitions can lead to distortions when there are delays in submitting or processing claims for time off work.

Use paid costs only

A final option is to simply ignore the outstanding component of lifetime cost and use paid costs only. Such an approach implicitly assumes that the amount paid to date on a claim relative to other claims is a good indicator of its outstanding costs relative to other claims

The advantage of this approach is simplicity and transparency. The disadvantage is that estimates are not responsive to the current circumstances or likely ultimate total cost of the claim. By not being responsive to the current circumstances or likely ultimate total cost of the claim, this approach is demonstrably worse at ranking individual claims from high cost to low cost when compared to Comcare's SCE. This is illustrated in Figure 4.1 which compares the ability of the SCE model and paid costs to predict the relative size of outstanding costs.

Figure 4.1 **Comparison of the ability of paid costs and the SCE to predict the relative size of outstanding costs for individual claims**[2]

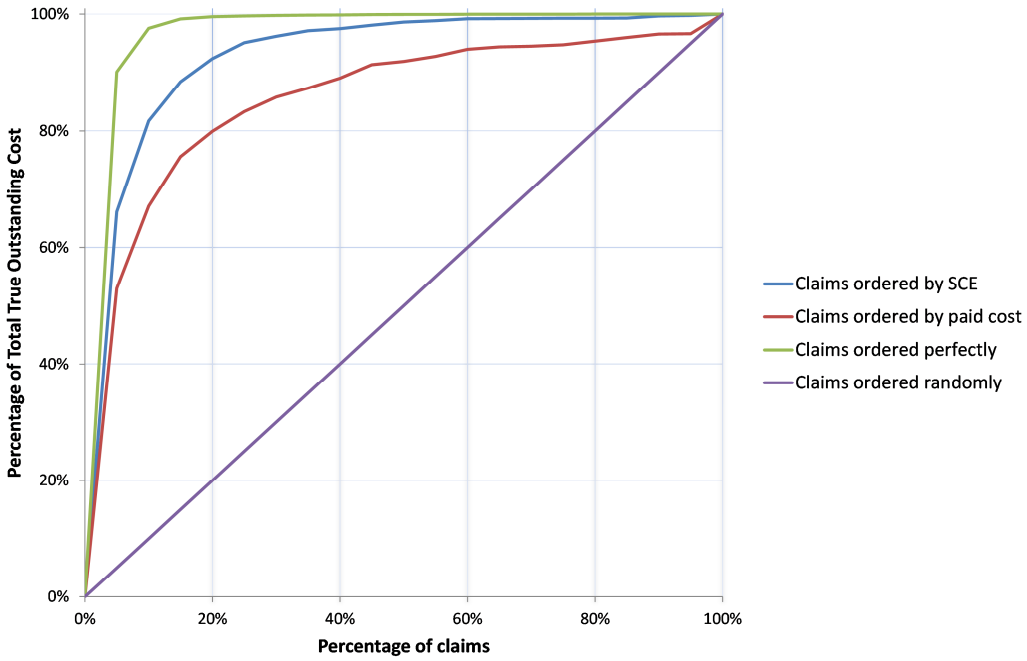


Figure 4.1 shows that if the SCE is used to order claims from largest to smallest (the blue line) then the first 20% of claims contains 92% of the 'true' outstanding costs. If the SCE model had perfect predictive accuracy (impossible for any model, but shown by the green line) then the first 20% of claims would contain close to 100% of the true outstanding costs. Had the SCE been not working at all (the purple line) then the first 20% of claims would have contained only 20% of the true outstanding costs. Because the performance of the SCE model is close to the green line it is working well.

However, if we use paid costs to order claims from largest to smallest (the red line), then the first 20% of claims contains 80% of the 'true' outstanding costs – a result that is significantly worse than the SCE model. This assessment has some limitations. Notably that our estimate of 'true' outstanding costs is still reliant on the SCE to predict costs beyond 30 June 2015. The impact of this limitation is a slight overstatement of the performance difference.

4.1.4 Recommendations for estimating the outstanding component

When the advantages and disadvantages of each approach are considered, on balance we believe that Comcare's premium model should continue to use statistical case estimates, at least in the short-term.

While manual case estimates have many desirable properties for case management, when used as the basis for premium setting their subjective nature creates important risks for

[2] This analysis uses accepted claims in the 2006 to 2009 calendar injury years as at 31 December 2009. The true outstanding cost for these claims as at 31 December 2009 has been taken to be the incurred cost as at 30 June 2015 less payments to date as at 31 December 2009.

Comcare. To establish a manual case estimation process would be costly as teams would need to be created and trained or external estimators would need to be engaged. Processes to ensure consistency and to minimise the risks arising from conflicts of interest would need to be established. And in the end there is no evidence to suggest the manual estimates would be more accurate than the current process.

However, we recommend that the current SCE model be reviewed and its performance assessed against the simpler alternatives discussed above. The credibility of complex models like the SCE is dependent on evidence that they are working well. Working well in this case is necessarily a relative concept. The justification for continuing to use the SCE is dependent on it working better than the available alternatives. We demonstrated in Figure 4.1 that the SCE is working better than a simple approach based on paid costs. However it remains to be seen whether the model works materially better than some other simpler alternatives.

It has been over 10 years since the SCE was the subject of review. It seems timely then to consider a review of its underlying structure. Questions of particular interest in such a review would be:

- Are there changes to the current SCE structure that could be made to make it more responsive to changes in a claimant's circumstances?
- Should the model be extended so that case estimates are placed on those claims that are reported but not yet determined and those claims which have been rejected, but which have a chance of being accepted upon appeal?

4.2 Introduce a simplified and more transparent premium model

Recommendation 2

Adopt a simplified and more transparent premium model. The recommended model will produce premiums that are more stable yet have the appropriate responsiveness to changes in an employer's claim performance.

A key goal of the Commission's *Premium Determination Guidelines* is that the impact of claim performance on premiums should be transparent. In our consultations with employers one of the strongest themes to emerge was that the current premium setting model used by Comcare did not have a transparent link between claims experience and changes in premiums.

To address this issue we recommend that Comcare adopt a simplified and more transparent premium model. The technical specification of the recommended model is given in Appendix B. In the following section we describe the key features of the recommended model.

4.2.1 Key features of the recommended model

A transparent link between claims experience and changes in premiums

Our proposed premium model has the following structure:

Prescribed Amount (as a % of wages) = Previous Prescribed Amount (as a % of wages)

x *Pool Trend*

x *Performance Adjustment*

This structure explains all movements in the Prescribed Amount in terms of:

- Changes in the overall premium pool (as a percentage of wages) referred to as **pool trends**
- Changes in **individual employer claim performance** relative to other employers.

The separate components explaining the change reflect the two-step premium setting process described in Section 2.3.2.

The **pool trends** are the result of changes in the premium pool (as a percentage of wages) between the previous premium year and the current premium year. They also take into account changes in the distribution of wages and relative claims performance across all employers. The pool trends are the result of trends in claims experience across all employers and across both short and long duration claims. The experience of each individual employer contributes to the pool trend but no individual employer is solely responsible for the overall trend. The key drivers of pool trends are reported to Comcare each year when the independent actuary provides an estimate of the new premium pool amount.

The **Performance Adjustment** has the form:

$$Performance\ Adjustment\ =\ 1\ +\ Z\ \times\ (Performance\ Ratio - 1)$$

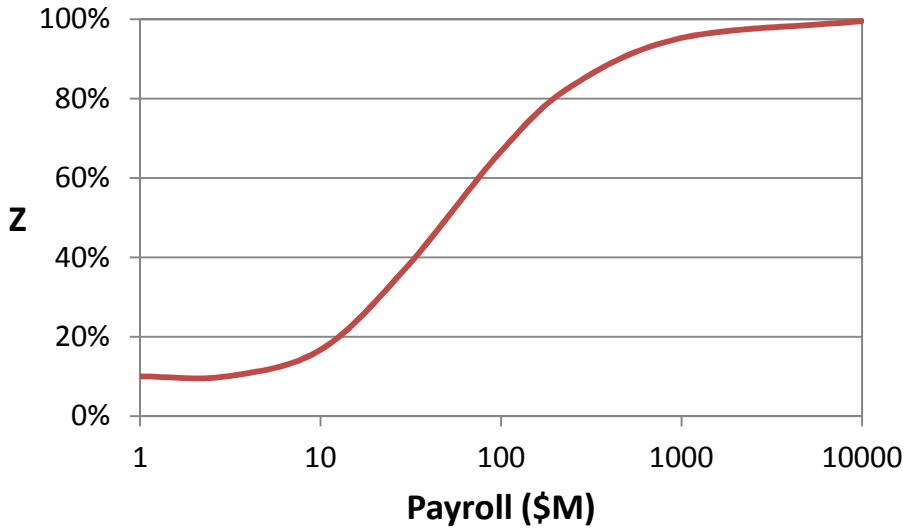
The performance ratio is a measure of the claim performance of the employer in the responsibility window relative to what was expected when the previous Prescribed Amount was set. If the performance ratio is less than one then claims performance was better than allowed for in last time's premium and so the new premium amount is reduced. If the performance ratio is greater than 1 then the new premium is increased.

The responsiveness of the performance adjustment to the performance ratio is controlled by the credibility factor Z. The greater the volume of claims experience for a particular

employer, the larger the value of Z and the more weight (or credibility) given to the performance ratio. This is consistent with standard credibility theory which finds that more weight should be given to measurements that are based on a higher volume of data. The recommended model uses the product of recent wages and the previous prescribed amount (as a % of wages) as a measure of the volume of claims experience. This approach is similar to that used in other schemes in Australia such as NSW.

The figure below shows how the recommended value of Z changes with payroll for an employer with a premium rate equal to scheme average.

Figure 4.2 **The recommended credibility factor, Z, as a function of payroll for an employer with a premium rate equal to scheme average**



The performance ratio is defined as follows:

$$Performance\ Ratio\ = \frac{Incurred\ cost\ rate\ for\ the\ employer}{Benchmark\ incurred\ cost\ rate\ for\ the\ employer}$$

Where

- The **incurred cost rate for the employer** is the weighted average total lifetime cost of accepted claims per unit wages for the employer over the responsibility period.
- The **benchmark incurred cost rate for the employer** is the weighted average total lifetime cost of accepted claims per unit wages for the pool as a whole over the responsibility period, multiplied by the ratio of the previous employer premium rate to the previous pool average premium rate (excluding the administrative expense component of the premium rates).

Reported incurred cost is the measure of claims experience. No separation into frequency and average claim size components

In Section 2.3.2 we noted that the Comcare premium model breaks claim cost into two components, claim frequency and average claim size. The rationale for separating cost into its components is that in theory this approach will result in better estimates of the 'true' claims cost. However, the disadvantages of treating them separately are that the model becomes more complex and can appear overly responsive to small claims.

We have found the proposed model performs well when reported incurred cost is used without breaking it into its components, and that by using this approach some of the less desirable features of the current model are avoided. The performance of the proposed model is discussed in more detail later in this section.

Maintains the four year responsibility window

One of the main outcomes of the employer consultations was that employers, in general, considered that the four year responsibility window provided an appropriate balance between:

- The need for the model to be responsive to recent experience
- The desirability of maintaining incentives to manage longer duration claims.

We agree that the four year window is an appropriate balance to these two goals.

The current premium model gives more weight to more recent injury years in the responsibility window. The extent of the increase in weight to more recent injury years depends on the payroll of the employer. Smaller employers have more or less equal weight given to all four injury years while larger employers have significantly more weight given to the more recent injury years. Such an approach is optimal with respect to predictive accuracy in an environment where the 'true' premium rates for an employer are expected to move and the direction of movement (up or down) is not known.

For our proposed model we investigated whether applying equal weights or more weight to recent injury years in the responsibility window would give better model performance. It was found that equal weights improved both the stability of the model and the accuracy of the model in relation to estimating the ultimate relative performance of employers. The measures we used for assessing stability and accuracy are discussed in more detail below.

The use of equal weights over the four year window will not be appropriate for employers who joined the Commonwealth premium pool part way through the window or who have had significant changes in size during the window. For new entrants the window will need to be shortened to include only the years for which the employer has experience. In these cases the *benchmark incurred cost rate for the employer* used in the performance adjustment of premiums would need to be modified to account for this.

For employers with a significant change in size the claim experience prior to the size change is arguably less relevant for estimating future claim performance. In theory there is justification for down-weighting this earlier experience. Such changes in size have characteristics similar to Machinery of Government changes and in this respect are probably best dealt with on a case by case basis. In each case Comcare would need to determine whether there was justification for down-weighting the earlier claim experience

of the employer. If such an approach was adopted it would be necessary ensure that re-weightings only occurred when there was a significant change in size. For example a policy could be adopted that required at least a 25% increase in payroll (in real terms) over the four year window before re-weighting of past experience could be considered.

The current premium setting process uses injury years on a calendar year basis for the responsibility window while the premium years are on a financial year basis. This means that the responsibility period ends six months prior to the start of the premium year. The advantage of this approach is that the most recent information available, given timing constraints, is used for premium setting. Also, when used with the proposed model, this approach results in a bonus/penalty amount that responds to claim performance in part of the premium year that is being re-assessed (see Section 4.7 below).

The disadvantage of this approach is that the analysis is slightly more cumbersome – many inputs into the model and associated monitoring processes need to be summarised on both a calendar injury year and a financial injury year basis.

It would be possible to use a responsibility window based on financial injury years so that some of the cumbersome aspects of the analysis are removed. The choice depends on the perceived benefits of:

- Allowing premiums to be influenced by the most recent claim performance possible, versus
- The inconvenience and distraction caused by an experience window that doesn't line up with past premium years.

Although not tested, we do not think that the use of a responsibility window based on financial injury years would have a significant impact on model accuracy. This is because the most recent six months of claim performance data that is lost using this approach is relatively immature and so is a less reliable indicator of future performance.

Another option open to Comcare is to use a four and a half year responsibility window ending 31 December. Such an approach aligns most of the responsibility window to past premium years, but with an additional six months to take account of the most recent information available. This approach comes with the cost of using a longer responsibility window. If this approach was adopted the credibility parameter of the proposed model would need to be recalibrated.

We recommend that Comcare weigh up the advantages and disadvantages of moving to a responsibility window that aligns with past premium years.

Continues to rely on an evolutionary credibility approach

Our proposed model is still an evolutionary credibility model. However it is more transparent than the current model due to the following simplifications:

- The proposed model creates a direct link between claims experience and changes in the Prescribed Amount.
- The model does not separate claims costs into frequency and average size components and ignores 'IBNR' claims.
- The model makes explicit that premium setting is a 2 step process – effects of pool trends and employer experience relative to pool are treated separately.

The first two of these simplifications are sub-optimal from the perspective of producing a model that is as accurate as possible. A model that is as accurate as possible will, if not subject to additional constraints, produce premiums that are free of cross-subsidies. However, Comcare's premium setting guidelines require only that premiums be free of cross subsidies in the long-term. There is an acknowledgement that predictive accuracy can be sacrificed to meet other premium setting goals as long as the model has no long-term biases built in. We provide an analysis of how the proposed model compares to the existing model across a number of measures in Section 4.2.2.

We note that an evolutionary credibility model remains a suitable approach in the Comcare scheme because appropriate risk groups for Comcare employers are currently unavailable. This issue is discussed further in Section 5.1.

One issue with the current model is that small employers can experience premiums that appear quick to respond to poor experience but slow to respond to good experience. This remains an issue for the proposed model and a potential solution is discussed in Section 5.1.1.

4.2.2 Performance of the proposed model compared to the current model

The performance of the proposed model has been compared with the performance of the current model across two measures:

- The trade-off between stability and accuracy
- Responsiveness to changes in claims performance.

The performance has been assessed by back-testing the model over the premium years 2008/09 to 2015/16. In carrying out the analysis we have removed the the impact of pool trends and Machinery of Government changes (See Appendix C).

The trade-off between stability and accuracy

There is a trade-off between stability and accuracy for all premium models. This trade-off occurs because accuracy is maximised only when there is an appropriate balance between responsiveness to genuine changes in experience and stability in response to random or chance movements.

Stability refers to a measure of the year on year premium movements experienced by employers. There are a number of ways of measuring stability but initially we will measure it as the percentage of employers who receive a change in their premium rate of more than 20% up or down. The less stable a model – or alternatively the more responsive a model – the larger the percentage of employers with changes more than 20%. In our analysis, pool trends have been removed and so the analysis measures the stability in the face of performance adjustments only.

Accuracy is a measure of how well each model measures the 'true' ultimate relative performance of employers. Again there are number of ways to measure accuracy but we have used the average difference (ignoring sign) between the model's prediction of relative performance and the true 'ultimate' relative performance. A difficulty with estimating accuracy is that the true cost will only be known for a premium year many decades into the future. Because of this we have had to rely on the SCE to estimate

outstanding costs beyond 30 June 2015 and in assessing accuracy we have restricted our view to the earlier premium years for which the necessary data are available (2008/09 to 20012/13).

The trade-off between stability and accuracy for both the current and proposed models are shown in Figure 4.3.

Figure 4.3 **The trade-off between stability and accuracy for the current and proposed models. In the proposed model the trade-off is controlled by a single credibility factor. In the current model we have controlled the trade-off using the frequency volume parameter.**

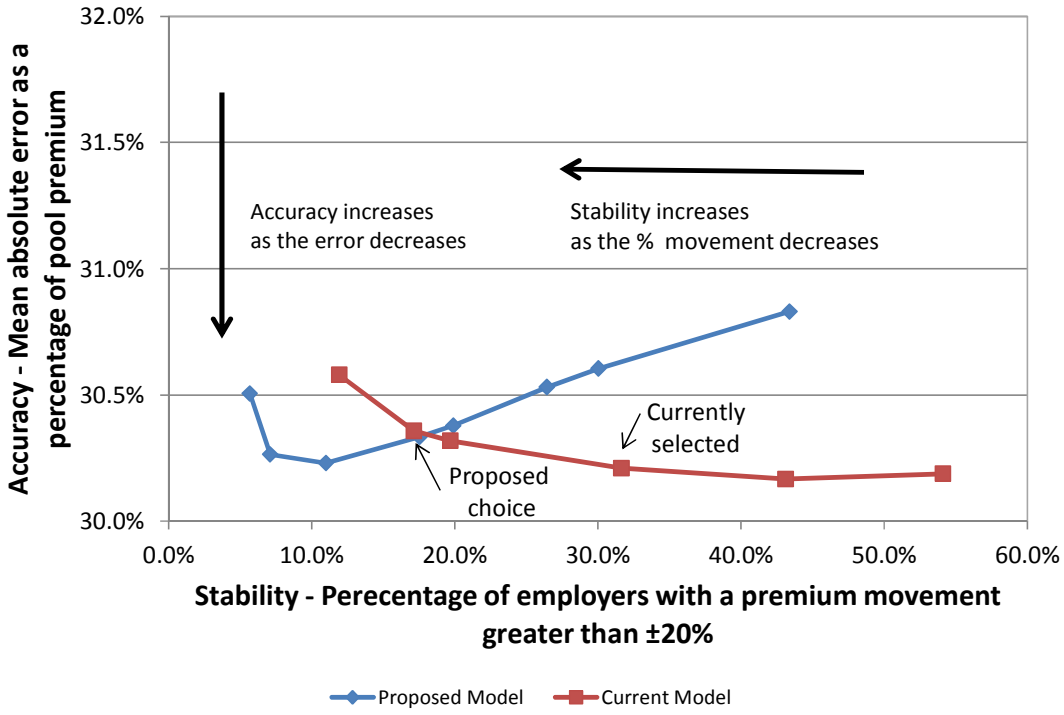


Figure 4.3 shows:

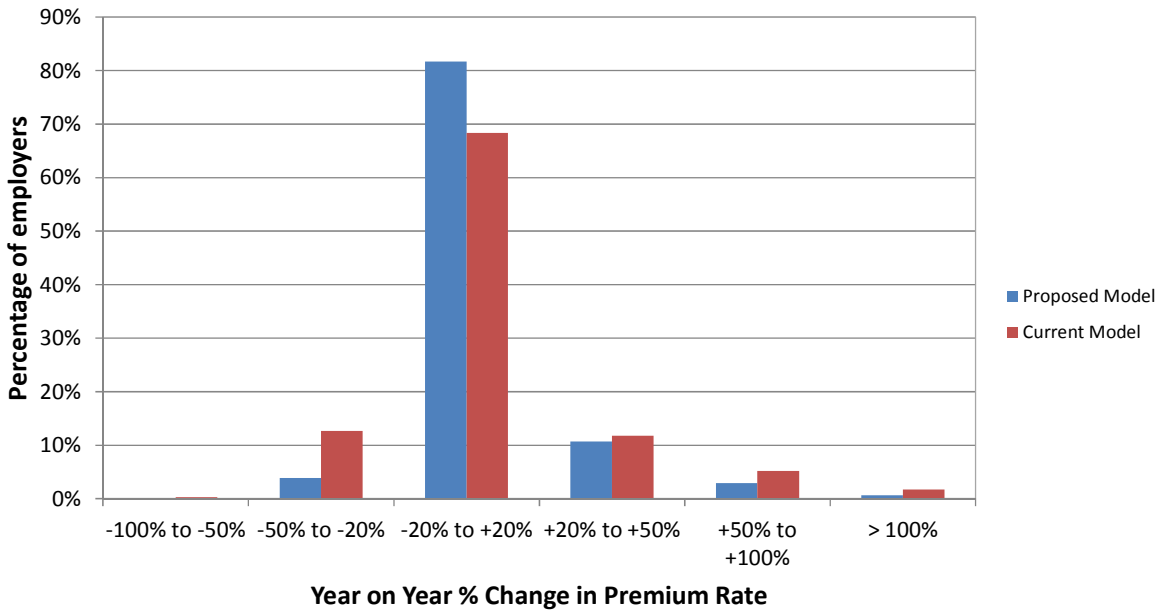
- If each model is parameterised to be unstable (responsive) then the current model is moderately more accurate than the proposed model. This occurs when the percentage of employers with premium movements above 20% is greater than 20%
- If each model is parameterised to be more stable then the proposed model is moderately more accurate. This occurs when the percentage of employers with premium movements above 20% is less than 20%.
- The current model is able to produce the most accurate predictions. However, the parameterisation which results in the most accurate predictions comes at the cost of instability. The parameterisation used at present for the current model (the red point labelled 'currently selected') results in greater stability but less accuracy compared to the most accurate model.
- The blue point labelled 'proposed choice' is our recommended parameterisation of the proposed model. This exhibits slightly more responsiveness than the highest possible accuracy parametrisation for this model. Although there is a more accurate parameterisation of the proposed model, this accuracy comes at the cost

of less responsiveness. An examination of the responsiveness of the model to downward and upward trends in employer claims experience suggests that a slightly more responsive model than the most accurate one is preferable (see below).

- Our selected proposed model shows a 0.4% decrease in accuracy relative to the currently selected model. We judge this accuracy cost to be small relative to the average year on year movement of around 20% in the current model.

The following two figures give more detail on the stability performance of the selected models Figure 4.4 shows the current model is more likely to result in very large premium movements.

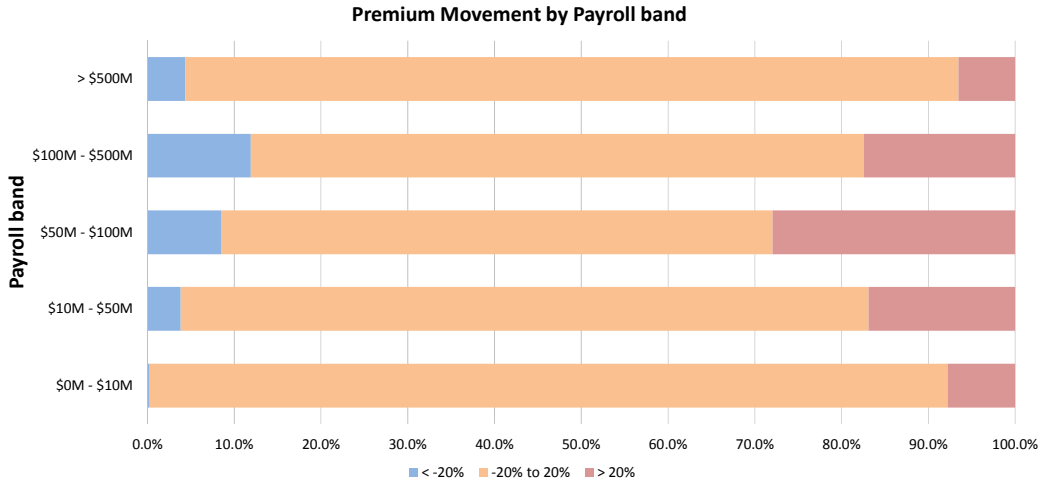
Figure 4.4 **Comparison of stability between the current and proposed models**



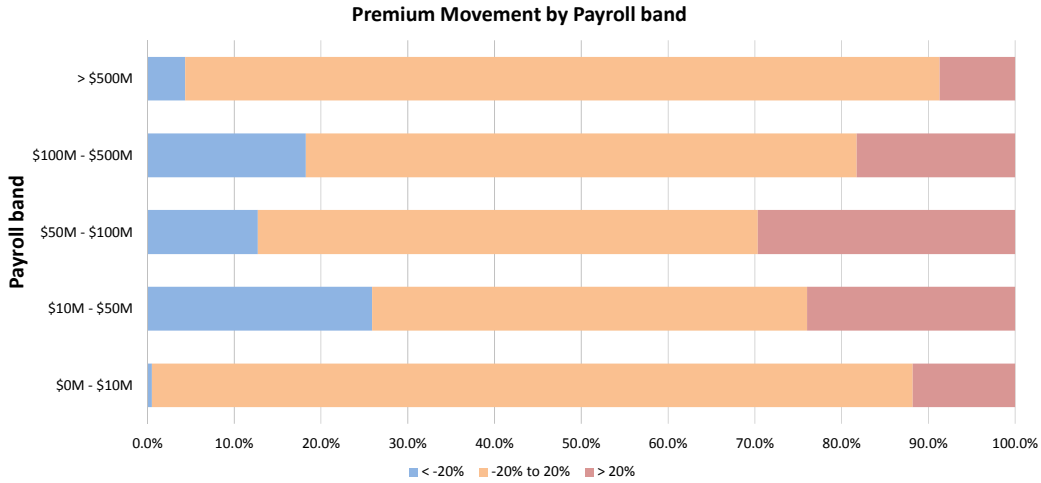
The second figure on the following page shows that under the current model the premium rate increases have occurred relatively evenly across small, medium and large employers.

Figure 4.5 **Stability by payroll band**

A. Proposed Model



B. Current Model



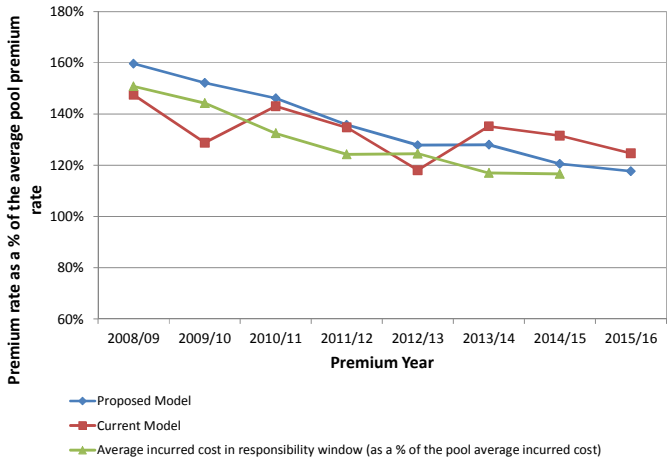
Although the stability of the proposed model has been better than the current model in back-testing, there is a risk that small employers will face unacceptably large increases in premiums if they incur a catastrophic claim. This is discussed further in Sections 4.5 and 5.1.1.

Responsiveness to changes in claims performance

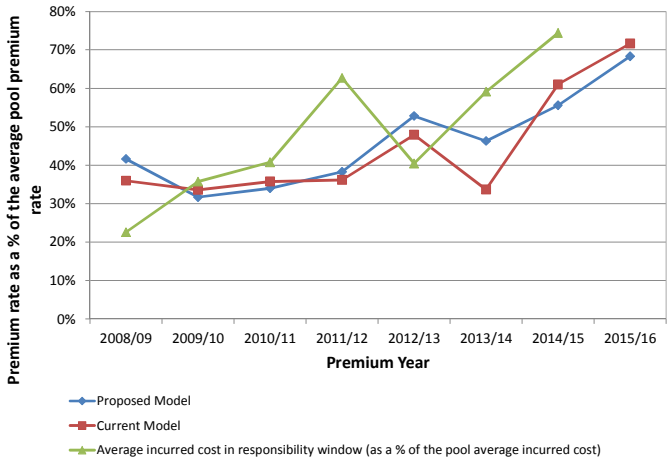
The stability and accuracy trade-off is not the only measure used to judge premium model performance. Another measure, though more qualitative, is to assess how the model responds over time to trends in an employer's claim experience. The following diagrams demonstrate, by back-testing on Comcare's historical data, how the current and proposed models respond to changes in claim experience for a range of large and small employers who have exhibited trends in claim performance over the last eight years.

Figure 4.6 **Responsiveness to changes in claims performance**

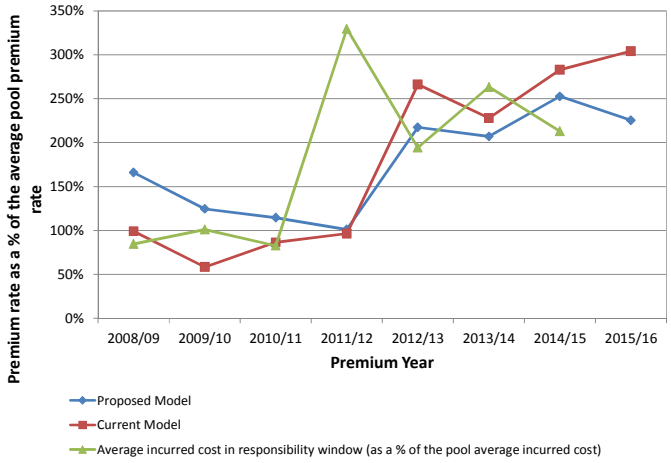
Actual employer with payroll greater than $1000M



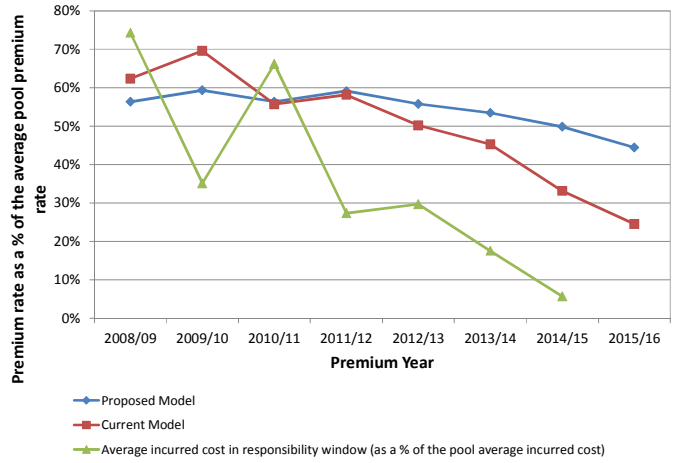
Actual employer with payroll around $200M



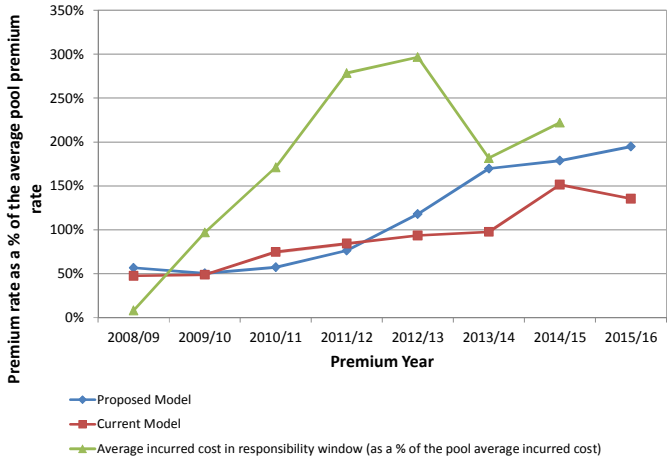
Actual employer with payroll approximately $50M



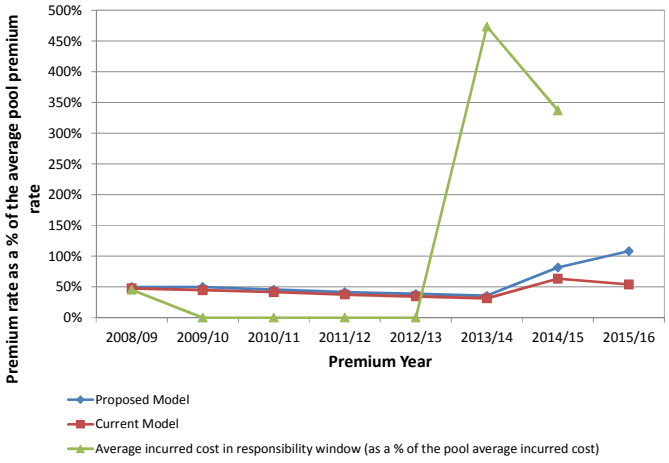
Actual employer with payroll around $20M



Actual employer with payroll approximately $20M



Actual employer with payroll around $5M



The figures on the previous page show the changes in premium rates under the proposed model (blue line) compared to the current model (red line) over time. Also shown is the average incurred cost rate in the responsibility window (green line). With the proposed model an employer's premium rate for a year is calculated using a combination of the previous premium rate and the average incurred cost rate in the previous year. What one hopes to see in these graphs is a premium rate generally moving towards the green line value for the preceding year, but without unacceptably large jumps.

The figures show that, while the proposed model produces more stable or smoother changes over time, this has not come at the cost of responsiveness when compared to the old model. The one plot which shows less responsiveness for the proposed model (middle right) is matched by another plot for an employer with similar payroll which shows less responsiveness in the current model (bottom left).

4.2.3 Transitional issues

From a technical point of view, the proposed model should not create any significant transitional issues for Comcare. On first implementation the starting point for the new model will be the Prescribed Amount from the most recent premium setting process.

4.3 Update the PQRS with a focus on explaining the reasons for change

Recommendation 3

Update the Premium Quick Reference Sheet (PQRS) to be consistent with the new model and give more attention to explaining the reasons for change.

The employer consultations revealed a general desire for more narrative in the PQRS explaining the reasons for change. In response to this, one of key considerations we had in mind when designing a new premium model was creating a model that was sufficiently transparent so that the reasons for change were readily transparent and easily explained.

The new model, explains all movements in the Prescribed Amount and bonus/penalty amounts (see section 4.7) in terms of:

- Changes in the overall premium pool (as a percentage of wages) referred to as **pool trends**
- Changes in **individual employer claim performance** relative to the pool.

Developing narratives for each of these items should not place significant additional administrative burdens on Comcare. The key drivers of pool trends are reported to Comcare each year when the independent actuary provides an estimate of the new premium pool amount and these can form the basis of the pool trend narrative which is the same for all employers.

The changes due to individual employer claim performance will be a direct and transparent consequence of the employer's relative claim performance during the responsibility

window. This concept will require a general explanation that is applicable to all premium payers.

Similarly, the document *Comcare Premiums: your guide* will need to be updated to be consistent with the new model.

4.4 Retain the current approach to capping the costs of individual claims

Recommendation 4

Retain the current approach to capping the costs of individual claims, but increase the transparency of the process by publishing details of the dollar amounts used to cap claims.

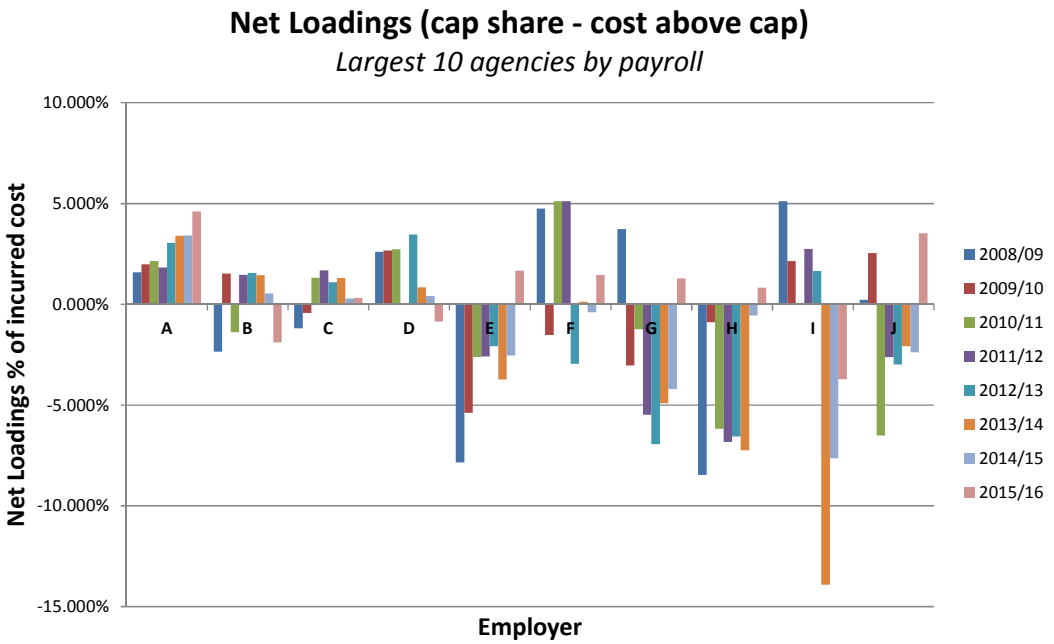
Claim capping involves capping the total amount of lifetime cost attributed to any one claim when assessing claim performance in past injury years. The rationale for claim capping is to protect the smaller employers from disruptive instability in premiums. Care needs to be taken with setting the cap because a lower cap can introduce or increase cross-subsidisation if large claims are more concentrated in some employers.

The claim cap used by Comcare is relatively high (between about $0.6M and $1.3M depending on how developed the experience year under consideration is) compared to other schemes. For example the cap used in the Victorian scheme is approximately $350,000.

Even though the current claim cap is high there is evidence that this cap introduces cross-subsidies. The claim caps that Comcare use are set so that the total value of costs in excess of the cap equals 5% of total costs for an injury year. In the absence of cross-subsidies, in some years employers would expect to see less than 5% of their claims cost exceeding the cap, while in others they would expect to see more. Over many premium years, however, the amount of claims cost exceeding the cap should average around 5%.

When we examined the 20 largest employers across the last eight premium years we found that at least four of those 20 employers appeared to be cross-subsidised on an ongoing basis by the other employers with respect to their large claims costs. For three of these four employers they were a net beneficiary of capping in seven out of the eight premium years. The results of this analysis are shown for the 10 largest employers in Figure 4.7. The figure shows evidence of ongoing cross-subsidisation for at least three employers.

Figure 4.7 **Net cap loadings (the difference between the 5% cap share and the own cost above the cap) for the largest 10 employers by payroll**



For each agency shown:

- 'Cap share' is the amount of the 5% of total pool claims costs in excess of the cap re-distributed to that agency
- 'Own cost above cap' is the costs in excess of the cap for that agency's own claims only which is re-distributed across all agencies in the pool.

Thus an agency for which {cap share – own cost above cap} is consistently positive (eg agency A) can expect to be a provider of cross-subsidies to other agencies, and an agency for which {cap share – own cost above cap} is consistently negative (eg agencies E and H) can expect to be a recipient of cross-subsidies from other agencies.

This analysis suggests that a lowering of the caps from their currently high levels would result in increased cross-subsides. In the light of this finding, and given that the consulted employers did not have any major concerns with the current capping process, we recommend that the current approach to capping the cost of individual claims is retained. However the transparency of the capping process should be improved by publishing details of the dollar amounts used to cap claims.

4.5 Consider limits on year on year premium movements

Recommendation 5

Consider limits on year on year premium movements. We recommend restricting such limits to premium movements driven by individual employer claim performance. We do not recommend limiting premium movements due to changes in the level of the overall premium pool.

The Commission's *Premium Determination Guidelines* require that Comcare's premiums avoid 'rate shock' as far as practicable. The term 'rate shock' is not defined in the guidelines but we loosely interpret it as disruptive instability in premium rates.

Comcare's current premium model contains no explicit caps on premium movements and relies on the parameterization of the premium model to dampen excessive movements. If we were to re-run Comcare's current premium model back though the last 8 premium years and remove the impact of pool trends and Machinery of Government changes, then the current model would result in:

- Increases in premium rates from one year to the next of more than 50% in 7% of cases
- Increases in premium rates of from one year to the next more than 100% in 2% of cases.

This result is taken directly from Figure 4.4 above. The model proposed in this review dampens these large changes a little with 3% of cases receiving increases of more than 50% and 1% receiving increases of more than 100%.

Our recommendation is for the guidelines to make explicit what is meant by 'rate shock' and to place a cap on premium movements due to **individual employer claim performance.** We do not recommend placing a cap on premium movements due to pool trends as to do so would have the effect of requiring the better performing employers to cross-subsidise the worst performing ones for trends that are the collective responsibility of all employers.

We recommend that the cap on individual employer claim performance premium rate changes is both a high-side and low-side cap. As a starting point it seems reasonable to us to cap **individual employer claim performance** premium rate changes in the range -50% and +100%, but we acknowledge that the decision of what constitutes 'rate shock' is essentially one of policy. However, given the current absence of a capping policy and a general desire amongst employers to avoid cross-subsidies where possible, we think that our relatively wide suggested range is a reasonable starting point.

The rationale for including both a high-side cap and a low-side cap is that the low side cap is used to fund the short-fall created by the upside cap. However, the extra premiums received due to the low side cap will in most years not be sufficient to offset the loss of premium from the high side cap, and the shortfall in premiums created by the cap will need to be funded by a small additional loading across all employers. A narrower capping

range would require a larger loading. This loading would be included as part of the **pool trend**.

An additional constraint may also be considered. The four year responsibility window means that a small employer incurring a catastrophic claim could still experience a premium increase of 16x over a four year period (perhaps more without a year on year cap). To protect against such disruptive movements, a limit over a four year period of between -75% and +300% may also be advisable. Had such a limit been in place over the eight year back-testing period it would have been applied to four employers (under both the current and the proposed model). In Section 5.1.1 an alternative premium model for small employers is discussed which would reduce the need for such a cap.

For employers affected by Machinery of Government changes it is recommended that these caps only apply after historical premium rates have been re-stated to be consistent with the current agency structure.

4.6 Investigate allocating the fixed costs of the scheme in proportion to payroll

Recommendation 6

Investigate whether the administrative expenses included in the premium pool can reasonably be divided into:

- Those relating to claims management and which are reasonably allocated to employers in proportion to expected future claims costs, and

- Those relating to other functions which are reasonably allocated to employers in proportion to wages.

Comcare's current premium structure does not include any limits on the minimum premium charged to an employer. Comcare have raised the question whether employers on the lowest premium rates (currently 0.1% of payroll) are contributing sufficiently towards to fixed costs of Comcare.

4.6.1 The functions of Comcare and a recommended approach to the allocation of administrative costs

Comcare's organisational structure has two parts. One side is responsible for scheme management while the other side is responsible for claims and liability management. Our understanding is that employers contribute to the administrative costs of the scheme management side via a 'regulatory contribution' while the administrative costs of the claims and liability management side are contributed to via the management expenses component of premiums.

The administrative costs of the claims and liability management side of Comcare can be broadly divided into two: those costs supporting Comcare's claims management function and those costs supporting other functions such as setting and collecting premiums. Some

costs support both functions, such as the costs of the executive and 'shared' services, but these can notionally be divided across the two functions.

The Commonwealth premium pool includes a loading to cover the total of all Commonwealth employers' share of the administrative costs associated with the claims and liability management side of Comcare. Comcare's current premium model allocates all of these administrative costs to individual employers in proportion to the expected cost of claims for the employer in the premium year. Such an approach can be considered appropriate for those costs classified as claims management because the larger an employer's expected future cost of claims the more that Comcare's claim management services will be used. However, it may not be appropriate for other costs. For example the cost of setting and collecting premiums is probably similar across all employers irrespective of their expected future claims costs. There are other costs, such as relationship management, that are possibly more equitably split by payroll.

The allocation of administrative costs to functions and determining the most equitable way to allocate those expenses is necessarily approximate. This means that complex models of expense allocation are usually not warranted. However, we recommend that Comcare investigate whether the administrative expenses included in the premium pool can reasonably be divided into:

- Those relating to claims management and which are reasonably apportioned to employers in proportion to expected future claims costs, and
- Those relating to other functions which are reasonably apportioned to employers in proportion to wages.

However, any change to the way that administrative expenses are allocated to employers would need to be checked for consistency with Section 97A of the SRC Act.

4.6.2 The impact of a change in administrative expense allocation

The effects of the proposed change are uncertain because Comcare do not currently have an allocation of expenses into the required categories. However under two plausible scenarios – 15% or 30% of administrative expenses included in the premium pool allocated to other functions – the following impacts are expected:

- The proposed changes create a minimum premium for employers. With a 15% allocation to other functions the minimum premium is 0.05% of wages. With a 30% allocation the minimum premium is 0.1% of wages.
- Those on the lowest premium rates will see large percentage increases in premium rates. The lowest premium rate is currently 0.1% of wages. With a 15% allocation to other functions this premium rate would increase 44% to 0.144%. With a 30% allocation the premium rate would increase 88% to 0.188%.
- With a 15% allocation to other functions the smallest 10% of premium rates would receive an increase of greater than 10%. With a 30% allocation the smallest 20% of premium rates would receive an increase of greater than 10%.
- Premium rates around the pool average of 2% of wages would remain unchanged under both scenarios.
- The maximum premium rate of about 10% of wages would reduce by about 2% to 9.8% with a 15% allocation. With a 30% allocation the reduction would be about 4% to 9.6%.

The premium effects on employers with very low premium rates could be large as a proportion of current (low) premiums for those employers. If this change is implemented, it may be appropriate to impose the change gradually over a few years.

4.7 Retain the current bonus/penalty system with some modifications

Recommendation 7

Retain the current bonus/penalty system with some modifications to increase transparency and the incentive effect.

The employer consultations revealed that there was a general acceptance amongst employers that the current bonus/penalty arrangements were a reasonable approach to increasing the price signal in premiums. And, although the bonus/penalty arrangements increase premium uncertainty for budgeting purposes, no employer expressed a desire to change these general arrangements.

The simplified premium model that we recommended in Section 4.2 supports Comcare's existing bonus/penalty arrangements. It does have two advantages over the current system:

- Transparency – the Bonus/Penalty amount is calculated as:

Bonus/Penalty = Previous Prescribed Amount x (Performance Adjustment -1)

where the performance adjustment is the same one that is used to calculate the new Prescribed Amount. In other words the same performance adjustment is used to calculate the revised premium for the last financial year and the new Prescribed Amount for the new financial year.

- If the four year responsibility remains unchanged from that used in the current premium model then the bonus/penalty amount will take account of experience development in part of the premium year that is being re-assessed. It is arguable that the incentive effect is increased by doing so.

In Section 2.3.2 we noted that the current bonus/penalty procedure does not take account of movements in the premium pool estimate that occur over the year. The accuracy of the bonus/penalty amount would be improved if it did. This may reduce the need for future deficit reduction levies to fund premium shortfalls.

An argument against including changes to the pool estimates in the bonus/penalty amount is that the incentive effect of the bonus/penalty may be reduced because the amount would then depend on both an employer performance adjustment and a pool trend change.

We have no strong view on which approach Comcare should take with respect to updating the pool amount for bonus/penalty purposes, but we recommend that Comcare consider the advantages and disadvantages of the two alternatives.

4.7.1 Hindsight adjustments to premiums extending over several years

Comcare's bonus/penalty system involves a single recalculation of an employer's premium rate for each premium year one year after it was initially set. The main motivation is to enhance the financial incentives to invest in safety and rehabilitation. Successes in safety and rehabilitation which reduce claims costs in the responsibility window after the last premium was set influence both the new premium amount and the revision of the premium amount that was set last year.

It is possible to extend the concept of bonus/penalty adjustments so that adjustments to premiums are made over several years. In such cases the final premium paid may not be known for (say) up to five years from the start of the premium year.

There are two main reasons for extending bonus/penalty adjustments:

- **To increase responsiveness to claims experience** – the responsiveness of premiums to an employer's own claims experience is increased enhancing the incentive effect.
- **To increase premium accuracy** – more information is known about claims development in the premium year, and the years immediately preceding it, allowing for a more accurate estimate of the ultimate cost for the premium year. This can lessen the chance of a premium year funding deficit emerging.

Extended bonus/penalty adjustments do come with some downsides:

- **Premium year uncertainty** – final premiums for a particular financial year may not be known for five years or so depending on the length of the adjustment window. This can create budgeting issues for employers as the budget forecast needs to take account of expected premiums for the next financial year and also revisions to the five or so previous premium years.
- **Increased year on year premium variability** – this is not a necessary outcome of extended penalty/bonus adjustments but it is a typical one because of the way these arrangements are usually structured. Both the current and proposed bonus/penalty arrangements achieve an increase in both incentives and accuracy without a cost of increased year on year premium variability. They achieve this by estimating a revised estimate that is a better estimate of the underlying 'true' cost (see Section 2.3.2). However most arrangements with extended bonus/penalty adjustments are designed to pass on to the employer some of the random or chance component of cost. Because of this, such arrangements are usually only suitable for large employers where the premium variability caused by such 'risk sharing' is less.

Options available to Comcare for extending bonus/penalty adjustments

Maintain the current premium setting model

One of the advantages of the current premium setting model is that, in its present form, it automatically calculates bonus/penalty adjustments for the prior three premium years. Only one of these adjustments is used at present, but in theory all three could be used. We do not recommend this approach because of the lack of a clear and direct link between claims experience and the bonus/penalty amount in the current model. Our proposed alternative premium model does not naturally re-estimate bonus/penalty adjustments past one year.

Calculate final premiums for a premium year based on the claims experience development in that year up to five years from the premium year start date

Such arrangements are used for each of the NSW and WA governments' public sector workers' compensation arrangements. These arrangements create a very close link between the final adjusted premium paid for a year and the claims experience that is emerging in that year. The downside is that considerable year on year premium volatility is passed on to the employer making these arrangements less suitable for smaller agencies. However minimum and maximum premiums could be used to soften some of the year on year premium variation.

Such arrangements require revised estimates of the premium on an annual basis (at least) over the period for which hindsight premium adjustments apply. These estimates will be used to determine both interim and final hindsight premium adjustments. In the Comcare scheme, these estimates are critical for determining the final premium because even with an adjustment period extending for five years from the start of the premium year, typically about half of the costs for that premium year remain unpaid at the completion of the adjustment period. Because of the large amount of unpaid costs involved an appropriate, and generally agreed, basis for making these estimates needs to be determined. In the NSW and WA governments' public sector workers' compensation arrangements these revised estimates are made by an independent actuary. This creates an additional administrative cost for running these types of arrangements. Even with independent actuarial assessments, these arrangements create the potential for dispute over the final hindsight premium amounts.

Paid Loss Retro (or 'burning cost') arrangements

Paid Loss Retro arrangements are available in the NSW and SA schemes for large employers meeting certain criteria. In NSW these arrangements have the following features:

- A low initial deposit premium is paid. The deposit premium is much less than the initial estimate of the full premium.
- A further four annual payments are then made, the amount depending on the emerging paid loss experience in the premium year. The amount of premium to be paid in each premium instalment is determined by applying proportional loadings (pre-determined at the time of policy inception) to the amount of paid costs.
- The final premium paid is subject to minimum and maximum amounts.

The 2003 Premium Review noted that Comcare had burning cost agreements for several years in the early 1990's with a small number of customers. They were phased out because of doubts over their legality under the SRC Act. The 2003 Premium Review also reported that these agreements were marked by a high level of disputation with the burning cost customers and the belief that the arrangements were not having the desired incentive

effects – the deferral of premium payments seemed to be the main attraction of the arrangements to employers at the time.

Although not stated in the 2003 review, we think it likely that the aspect of these arrangements that did not sit well with the SRC Act was the premium deferral component. If this is correct it may be possible for Comcare to enter into similar arrangements as long as premium deferral is not involved. Under such arrangements the first premium would be the Prescribed Amount (as determined by the recommended Comcare premium model) and all other premiums adjustments would be bonus/penalty amounts. The difference between this arrangement and the NSW and WA governments' public sector workers' compensation arrangements is that the final premiums are determined by a simple pre-determined formula which depends on paid losses only.

The use of a simple re-determined formula has some advantages and disadvantages. The advantage is that in being simple and pre-defined, premium disputes should be lessened. The disadvantages are:

- To work well these arrangements need the employer to have a relatively stable paid loss history. In NSW these arrangements are only available to employers with a payroll greater than $500M. Under similar criteria these arrangements would only be suitable for around seven Comcare employers.
- The use of the same formula for all large Comcare employers is probably not appropriate. The analysis shown in Figure 4.7 indicates that the large claim experience across the large employers can be very different. Such differences imply that the payment patterns for these employers can be very different and that the use of the same paid loss loading factors across all employers would not be appropriate.
- The use of a pre-determined formula doesn't allow for changes in the payment pattern of employers after the start of the premium year. Deterioration in the claims experience of long-duration claims is one potential change that could change the payment patterns for employers. This lessens the accuracy of such an approach.

Recommendations in relation to extending bonus/penalty adjustments

When we raised the possibility of introducing such arrangements with the larger employers during the consultations, they were in general ambivalent about the suggestion. While there was an acknowledgement that such arrangements could increase incentives to invest in safety and rehabilitation, there was a belief that Machinery of Government changes could make these arrangements complex and unmanageable.

In relation to extending bonus/penalty adjustments our own view is:

- The model that is proposed in this review, with a single bonus/penalty adjustment, already creates strong and transparent incentives to invest in safety and rehabilitation. This is achieved by a clear link between improvements in claim performance in the four year responsibility window and changes in premium amounts. For large customers the weight that would be given to an employer's own experience in the responsibility window is high (around 95% on average). This indicates that the proposed model is extremely responsive to the claims experience of the employers for which extended arrangements are feasible.

- We do recognize that arrangements with hindsight adjustments to premiums extending over several years have the potential to create even more enhanced incentives for larger employers.
- However we are unsure whether the additional incentives created by these arrangements are enough to outweigh the additional administrative burdens and risks they create.

The additional administrative burdens discussed above included the need to determine an appropriate estimate of the final premium. Additional issues that Comcare would need to consider were it to extend the period of bonus/penalty adjustments include:

- **Processes will need to be established to deal with Machinery of Government changes.** If a unit is transferred from an employer with premiums subject to hindsight adjustments, what happens to the arrangement?
- **A separate funding pool may need to be established for employers under these arrangements.** Employers under these arrangements will in general contribute less to any funding deficits or surpluses that arise because they take a greater share of the movements in premium estimate revisions. Employers under such arrangements would expect to have this taken into account when deficit reduction loadings are calculated.
- **Processes for dispute resolution will need to be established** and the legality of any proposed arrangements under the SRC Act established.

4.8 Maintain the current approach for Machinery of Government changes

Recommendation 8

Maintain the current approach for Machinery of Government changes.

Comcare's current approach to dealing with Machinery of Government (MOG) changes requires that the claims and wages history for agencies affected by the changes be re-stated as if the new structure had existed throughout the responsibility window. This can be a time consuming and difficult thing to do in part because of personnel changes and the boundaries of some roles/functions can be unclear. The difficulties are exacerbated when a particular work unit is subject to successive Machinery of Government changes.

There were two questions raised about this approach by stakeholders during the review process:

- Is it right to deal with MOG changes in this way? This question arose in the context of some employers having premiums adversely affected when an incoming unit had a poor claims history. For the affected employers there was a view that they have had to 'wear' the claims experience of claims that they have had no previous responsibility for.
- Can the process of dealing with MOG changes be simplified?

4.8.1 Is restating the claims cost history the correct approach (at least in theory)?

In the case of a unit transferring into another employer there are three reasons for restating the claims cost history of the new employer.

The first reason is that the incoming employees may have duties that change the risk profile of the receiving employer and hence the premium should respond accordingly.

Second, the claims experience of the incoming personnel may indicate a propensity to claim that differs from the receiving employer. Again the premium should be adjusted accordingly.

And thirdly, because under the SRC Act the rehabilitation authority is, in all cases, the injured employee's current Commonwealth employer, it is important that the financial incentive to continue that rehabilitation is transferred to the receiving employer. In relation to this last point we understand there will be cases where an employee injured while working in the unit was transferred but changed to a role outside the unit before the transfer occurred. In such cases there will be a mismatch between the employer with rehabilitation responsibility and the employer who carries the claims history. However, our expectation is that the number of such cases would be relatively small.

The main reason for not re-stating the claims history in the event of a transfer is that the injury prevention and rehabilitation management efficiency may differ between the receiving employer and that from which the personnel in question emanate.

On balance we believe that there is a stronger case for restating the claims history than not.

4.8.2 Can the process of dealing with MOG changes be simplified?

As discussed earlier, the process of re-stating the historical wages and claims history of the affected agencies can be time consuming and difficult and in some cases the data cannot be reliably obtained, particularly when a unit has been the subject of multiple MOG changes. Because of this it would greatly improve the efficiency of the premium setting process if the process could be simplified.

One possible simplification is to reduce the number of MOG changes that go through the historical restatement process. Many MOG changes involve the transfer of units that are small relative to the receiving employer. In such cases not re-stating the historical inputs to the premium model would only have a minor impact on premiums and on the grounds of efficiency could be justifiably ignored. The efficiency gains could be substantial because the work involved in a small MOG change is similar to that involved in a large one.

However the problem with such an approach is that, by not restating the history, the financial incentive to invest in the rehabilitation outcomes of transferred claimants is removed and this has the potential to cause poorer outcomes for injured employees. In addition, adverse developments in any claims from the transferred unit have the potential to affect the premiums of the employer the unit came from. This may generate a premium appeal from the affected employer.

It may be that the administrative savings from not re-stating the financial history for small transfers outweigh the potential costs outlined in the preceding paragraph. Even so, the

removal of the financial incentives to invest in the rehabilitation of some employees seems at odds with the general philosophy of the premium setting process.

4.8.3 Steps involved in maintaining the current approach for MOG changes if the proposed model of Section 4.2 is adopted

To apply the current approach for MOG changes with the proposed model of Section 4.2 the following steps are required:

- Restate the Previous Prescribed Amounts for the affected agencies. In the case of a unit leaving one employer to join another it would typically be assumed that the Previous Prescribed Amount rate for the leaving unit is the same as that for the employer the unit left. The Previous Prescribed Amount rate for the new combined agency would simply be the wage weighted average of the Previous Prescribed Amount rates of the merging unit and the employer gaining the unit.
- Calculate the Performance Adjustment (Section 4.2.1) with wages and claims for agencies affected by the changes re-stated as if the new structure had existed throughout the responsibility window.

5 ADDITIONAL ISSUES FOR CONSIDERATION

In this section we discuss some further issues for consideration in addition to our key recommendations in Section 4.

5.1 Consider the feasibility of developing employer risk groups

Consider the feasibility of developing employer risk groups for use in performance benchmarking. If they prove workable and useful, investigate the appropriateness of using these groups for setting the premiums of smaller employers.

5.1.1 Risk groups for the premium model

In our discussion of Comcare's current premium model in Section 2.3.2 we noted that there are two broad approaches to constructing workers' compensation premium models:

- Evolutionary credibility, and
- Hierarchical credibility.

Each of these approaches has its advantages and disadvantages and these are summarised in the following table.

Method	Advantages	Disadvantages
Evolutionary Credibility	●An employer's share of the premium pool depends only on the employer's own claim performance relative to the pool.	● Because the model relies on the employer's own experience only, the model may be less responsive to recent experience. This is a particular issue for small employers where recent experience is given a very small weight in such models.
Hierarchical Credibility	● Allows greater responsiveness to recent experience, although this experience may be grouped with other employers.	●Requires employers to be grouped into similar 'risk groups'. ●An employer's share of the premium pool depends in part on the claim performance of others in their 'risk group'.

Comcare's current premium model is of the evolutionary credibility type. The model we have recommended to replace it is also of the evolutionary credibility type. Our reason for continuing to recommend an evolutionary credibility model is that:

- Its approach to determining an employer's share of the premium pool based only on the employer's own experience is desirable for most Comcare employers.
- The model is acceptably responsive to claims experience, at least for medium and large employers.
- It avoids the cost and difficulties associated with developing a risk grouping for Comcare employers.

It does have one major limitation, and that is the way that the premiums for small employers evolve over time. In most years small employers remain claim free. During these times the evolutionary process creates a gradual decline in premiums. When a claim is reported, particularly if it is a large one, there is a spike in premiums. Such a premium trajectory is shown for one hypothetical small employer in the bottom right hand graph of Figure 4.6. After years of being claim free a single large claim causes a spike in premiums of more than 100% in both the current and proposed models (in the absence of any limit on the increase in an employer's premium rate from one year to the next). Such a response can give the impression of a model that is overly quick to respond to poor experience but slow to respond to good experience.

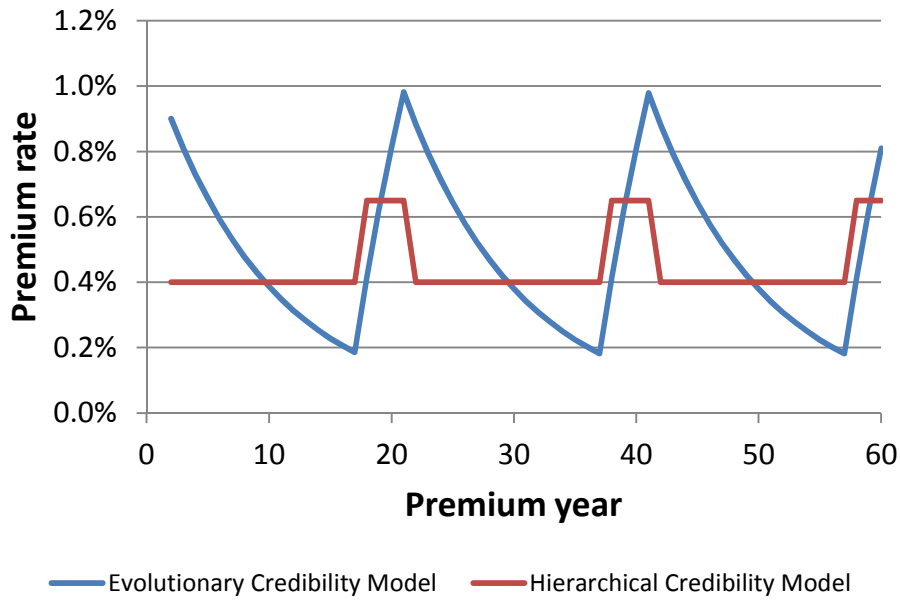
Figure 4.6 illustrates the zig-zag trajectory of premiums for many small employers. Such a trajectory is unavoidable under a pure evolutionary credibility model. One can control the steepness of the zig-zag via the credibility parameter(s), but if the zig-zag becomes too shallow then the premiums will be very unresponsive to claims experience. The zig-zag ups can also be controlled and spread over more than one year via appropriate limits on premium movements (see Recommendation 5).

An alternative approach for small employers is to use a hierarchical credibility approach. In such an approach small employers would be grouped into appropriate risk groups and the premium for the group would be determined using the recommended evolutionary credibility model. A sub-model based on hierarchical credibility would then determine the premium for a small employer as a weighted average of:

- The premium rate for the small employer's risk group, and
- The relative performance of the employer relative to the risk group in the responsibility window.

In this alternative model when the small employer performs better than its benchmark risk group a discount is received and vice versa. The difference in premium trajectories for this model compared with the one currently proposed is illustrated in Figure 5.1.

Figure 5.1 **Comparison of premium movements for a small employer (payroll $1M) with one claim of $100k every 20 years assuming stable pool and risk group premiums**



There are some disadvantages with this approach:

- The development of appropriate risk groups is a non-trivial task. It requires agreement on how the groups are to be defined, what criteria are used to determine group membership, and what to do for employers who are not easily categorised. The groups require continual maintenance and a mechanism for dealing with disputes over group membership.
- It adds some additional complexity to the premium model and the analysis of premium change. However transparency is maintained as all premium changes can be explained in terms of a pool trend, a risk group trend and an individual performance adjustment relative to the risk group.

Our understanding is that Comcare did develop a risk grouping for a premium setting model that was used in the 1990s and that the approach created concern with a number of employers, in part because there was resistance to being grouped with others. For this

reason we do not recommend using risk groupings in the revised premium models unless their value is first demonstrated in performance benchmarking (discussed next).

5.1.2 Risk groups for benchmarking performance

During the employer consultation, one employer noted that the price signal contained in premiums was not the only way to create incentives to improve safety and rehabilitation outcomes. They suggested that comparative performance benchmarks were another. Their suggestion was to publish performance league tables comparing the performance of agencies with similar workplace profiles. This would serve two purposes: to motivate poor performers to do better and to identify those who were doing things well so that their approaches could be emulated. It was suggested that the league tables should cover a wide range of performance statistics—not just premium rates.

We agree with this suggestion.

The number of groups may not have to be large for this type of monitoring to be effective – groups based on employer size and whether the agency was primarily a policy agency may be a reasonable place to start. It is likely that there would be a small number of agencies whose functions are sufficiently unique to mean that benchmark comparisons with other Commonwealth agencies would not be meaningful. However, that should not prevent development of groups for all other agencies.

5.2 Consider establishing a more comprehensive performance monitoring framework

Consider establishing a more comprehensive performance monitoring framework.

We think that it is important for Comcare to provide the Commission and employers with assurance that the premium model is meeting the goals and objectives of the scheme. To provide this assurance we think Comcare should routinely produce the types of performance analyses shown in Section 4.2.2.

In addition, legislative, cultural and workplace changes mean that a premium model that is suitable now may not be suitable in the future. Performance monitoring will allow Comcare to identify deteriorations in performance that are the outcomes of such change.

The existing performance monitoring we have seen focuses on the change between the revised premium for current financial year and the Prescribed Amount for the new premium year. We would prefer to see such analysis focus on changes in Prescribed Amounts from year to year and changes in final premiums from year to year as these are a better reflection of the year on year variability experienced by employers.

5.3 Consider the feasibility of introducing incentives for managing claims outside of the 'responsibility window'

Consider the feasibility of introducing incentives for managing claims outside of the 'responsibility window'.

5.3.1 Incentives in response to meeting particular operational outcomes

Comcare's current premium model and the premium model we have recommended provide financial incentives to employers in response to improved claim performance. The measure of claim performance used is claims cost.

An alternative, or addition, to such an approach, is to provide incentives in response to improvements in other desirable outcomes such as return to work rates. An example of such an incentive is the return to work incentive discount introduced to the NSW workers' compensation scheme this year. The return to work incentive discount applies a discount (ranging from 5% to 15%) to the cost of each claim used for an employer's performance assessment if the claim has achieved a sustainable return to work outcome up to 52 weeks since injury. Under the scheme's premium model this results in a premium discount for the employer.

There are advantages and disadvantages to such an approach.

Consider the specific case of the return to work incentive discussed above. The advantage of such an approach is that it directly incentivises improvements in arguably the most important rehabilitation outcome, return to work. While incentives built around past claim cost also incentivise return to work outcomes, the incentive is less direct.

The main disadvantage of such an approach is that it would introduce long-term cross subsidies if used with the current premium model or our recommended premium model. This is because employers who have a larger proportion of less severe claims and higher rates of early return to work will in effect already be receiving a premium discount which allows implicitly for their current higher return to work rates – this is a natural consequence of the premium models. If they are then given a further discount then that discount will need to be subsidised by other employers in the scheme. This illustrates an issue with all incentives not directly based on claim performance – they are difficult to implement without introducing cross-subsidies.

Another consideration with such an approach is that, if measures of sustainable work were to play an important role in premium setting, there would need to be tight controls around their measurement to avoid distortions.

The decision to implement such an approach then depends on the balance between the benefit of a direct incentive versus the costs of resulting long-term cross subsidies and some additional model complexity. Our own view is that in the Comcare scheme the benefit of the direct incentive does not outweigh the potential costs. This is because, as long as the premium model used has a clear link between claim performance and premium, the additional benefit of linking premiums directly to return to work outcomes

would be small – particularly if Comcare emphasise the link between claim performance and return to work performance in their PQRS and other educational efforts.

5.3.2 Incentives in relation to claims outside of the 'responsibility window'

Comcare's current premium model reduces the premiums of those employers who improve their claims experience in the four year responsibility window relative to other employers and it increases premiums for employers whose relative performance deteriorates. Under the Comcare scheme, employers still have responsibility for the rehabilitation of employees still receiving benefits outside of the four year window. However the current premium model does not directly incentivise employers to invest in the rehabilitation of these long-term claimants.

The introduction of operational targets in relation to claims outside the responsibility window may be one way to create incentives in relation to the long-term claims. The incentive would be created by giving discounts for meeting and or exceeding those targets.

In our consultations with employers this suggestion received a mixed response. Some thought that operational targets were a reasonable way to address this issue while others were sceptical that there was much that could be done for the rehabilitation of these long-term claimants (or at least that when weighing up the decision to invest in the rehabilitation of long term versus short term claims there was a much greater return on investment with the short term claims).

The issue of managing long-term claims is a difficult one and one that needs the collective efforts of both employers and Comcare. Successes in the rehabilitation of long-term claimants at the present time are likely to have a greater impact on the deficit reduction component of premiums rather than the Prescribed Amount component. One possibility is then to use operational targets as a means for adjusting an individual employer's contribution to the deficit. Those employers meeting or exceeding certain operational targets would receive a discount on their contribution to the deficit reduction component of premiums.

The development of reliable and fair operational targets for long-term claimants has a number of difficulties. For example the issue of assessing whether an employer has received a sustainable return to work for an employee has some difficulties. However we recommend that Comcare further investigate the feasibility of introducing incentives for managing claims outside of the 'responsibility window'.

APPENDIX A COMCARE'S CURRENT PREMIUM MODEL

A.1 Allocation of the total premium pool

The premium pool for Commonwealth agencies in total is set by the CEO (or delegate) of Comcare and is based on, amongst other things, independent actuarial advice. The determination of premiums for individual Commonwealth agencies involves the allocation of this premium pool to individual agencies in proportion with their estimated costs for that year according to the following equation:

$$\frac{P_{ij}^t}{P_j^t} = \frac{W_{ij}^t}{W_j^t}\hat{R}_{ij}^t \qquad [A.1]$$

where:

P_{ij}^t is the premium allocated to agency *i* in financial injury year *j* at time *t*.
P_j^t is the total premium pool in financial injury year *j* at time *t* (the omission of the argument *i* indicates that the relevant quantity is taken over all agencies).
W_{ij}^t is the wages for agency *i* in financial year *j* known (or estimated) at time *t*.
W_j^t is the total pool wages.
$\hat{R}_{ij}^t$ is the estimated "risk relativity" for agency *i*.

The risk relativity is the ratio of the estimated claim costs per unit wages for agency *i* relative to the estimated claim costs for the total pool per unit wages. It is equal to:

$$\hat{R}_{ij}^t = \frac{\hat{C}_{ij}^t/W_{ij}^t}{\sum_k \hat{C}_{kj}^t/W_j^t} = \frac{\hat{\mu}_{ij}^t}{\hat{\mu}_j^t} \qquad [A.2]$$

where:

$\hat{C}_{ij}^t$ is the estimated claim costs for agency *i* in injury year *j*
μ_{ij}^t is the estimated cost per unit wages for agency *i*
μ_j^t is the estimated cost per unit wages for the total pool.

In other words, premiums are allocated to individual employers according to the employer's proportion of total pool payroll and the relative riskiness of the employer.

A.2 Evolutionary credibility and estimating the risk relativity – motivation

Define the **direct experience estimate** of the risk relativity for employer *i* (the raw relativity of employer *i*) to be:

$$R_{ij}^t = \frac{C_{ij}^t/W_{ij}^t}{\sum_k C_{kj}^t/W_j^t} \qquad [A.3]$$

Where C_{ij}^{t} is the direct experience measure of claims costs for agency *i* in injury year *j* at time *t*.

The raw relativities are assumed to be generated by the following random process:

$$R_{ij}^{t} = r_{ij}^{t} + \vartheta_{ij}^{t} \quad [A.4]$$

for some parameters r_{ij}^{t} and random disturbance ϑ_{ij}^{t} with $E\left[\vartheta_{ij}^{t}\right] = 0$ such that

$$E\left[R_{ij}^{t}\right] = r_{ij}^{t}. \quad [A.5]$$

Also assume that the parameters r_{ij}^{t} evolve through a random walk such that

$$r_{ij+1}^{t} = r_{ij}^{t} + \omega_{ij+1}^{t} \quad [A.6]$$

where ω_{ij+1} is a stochastic disturbance with $E\left[\omega_{ij+1}^{t}\right] = 0$.

If ϑ_{ij}^{t} and ω_{ij+1}^{t} are normally distributed and stochasitically independent then it can be shown (a result of the Kalman Filter) that the maximum likelihood estimate of the risk relativity for employer *i* in injury year *j+1* using information known at time *t* on all injury years to *j* ($\hat{R}_{ij+1|j}^{t}$) is given by:

$$\hat{R}_{ij+1|j}^{t} = \left(1 - Z_{ij}^{t}\right)\hat{R}_{ij|j-1}^{t} + Z_{ij}^{t}R_{ij}^{t} \quad [A.7]$$

where Z_{ij}^{t} is a credibility weighting factor. A related result is:

$$\hat{r}_{ij|j}^{t} = \left(1 - Z_{ij}^{t}\right)\hat{r}_{ij-1|j-1}^{t} + Z_{ij}^{t}R_{ij}^{t} \quad . \quad [A.8]$$

In words, the maximum likelihood estimate of the risk relativity for year *j+1* is calculated in a recursive or evolutionary manner as a weighted average of:

- The previous year's maximum likelihood estimate for injury year *j*, and
- The direct experience estimate (or raw relativity) in injury year *j*

where the weight given to the direct experience estimate is controlled by the credibility factor Z_{ij}^{t}.

A.3 Comcare's evolutionary credibility model

Comcare's premium model makes separate evolutionary credibility forecasts of claim frequency ($R_{ij}^{t,f}$) and average claim size relativities ($R_{ij}^{t,s}$) such that:

$$R_{ij}^{t} = R_{ij}^{t,f} \times R_{ij}^{t,s} \; . \quad [A.9]$$

The standard rationale for separate forecasts of each component is that it makes greater use of the available information and this should lead to estimates with greater reliability.

A.3.1 Credibility estimates of claims frequency relativities

The credibility forecasts of the frequency relativities ($R_{ij}^{t,f}$) are forecast using an equation based on [A.7]:

$$\hat{R}_{ij+1|j}^{t,f} = C_{ij}^{t,f} R_{ij}^{t,f} + M_{ij}^{t,f} + \left(1 - C_{ij}^{t,f} - M_{ij}^{t,f}\right)\hat{R}_{ij|j-1}^{t,f} \quad \text{[A.10]}$$

where $R_{ij}^{t,f} = \frac{N_{ij}^{t}/W_{ij}^{t}}{\sum_k N_{kj}^{t}/W_{j}^{t}}$ with $N_{ij}^{t}$the estimated number of claims incurred in injury year *j* at time *t* and $C_{ij}^{t,f}$ and $M_{ij}^{t,f}$ are credibility parameters.

The main difference in the form of [A.10] relative to [A.7] is the inclusion of the $M_{ij}^{t,f}$ term. This term is only non-zero for very small employers. In effect it mutes the direct experience estimate of the relativity in injury year *j* by bringing slightly closer to the average pool relativity (equal to 1).

If *j* is the most recent injury year for which a direct experience frequency relativity estimate is available then the recursion starts with the direct experience estimate for year *j-3* and $\hat{R}_{ij-3|j-4}^{t,f} = \hat{R}_{ij-3|j-4}^{t-1,f}$.

The credibility parameters of [A.10] are determined using the following equations:

$$M_{ij}^{t,f} = 0.05 \times \left(1 - \min\left[\frac{W_{ij}^{t}}{W_{S,j}}, 1\right]\right) \text{ with } W_{S,j} = \$0.8M \text{ if } j \geq 2013/14 \quad \text{[A.11]}$$

$$C_{ij}^{t,f} = \left(0.05 - M_{ij}^{t,f}\right) + \left(X_j^f + \frac{V_j^f}{IBNR_{j,t}}\right)\frac{W_{ij}^{t}}{K_j^f + W_{ij}^{t}} \quad \text{[A.12]}$$

Where

$IBNR_{j,t}$ is the IBNR factor for injury year *j* at time *t*.

$$X_j^f = \begin{cases} 0.5 \text{ for injury year } j \\ 0.4 \text{ for injury years } j-1, j-2, j-3 \end{cases}$$

$$V_j^f = 0.3$$

$$K_j^f = \$40 \text{ M}$$

These equations have been chosen to exhibit the following desirable properties:

- The weight given to the direct experience estimate increases as the employer's payroll increases
- The less developed the injury year the less weight given to the direct experience component.

A.3.2 Credibility estimates of average claim size relativities

The credibility forecasts of the frequency relativities ($R_{ij}^{t,s}$) are forecast using an equation based on [A.7]:

$$\hat{R}_{ij+1|j}^{t,s} = C_{ij}^{t,s} R_{ij}^{t,s} + M_{ij}^{t,s} + \left(1 - C_{ij}^{t,s} - M_{ij}^{t,s}\right)\hat{R}_{ij|j-1}^{t,s} \quad \text{[A.13]}$$

where $R_{ij}^{t,s} = \frac{C_{ij}^{t}/N_{ij}^{t}}{C_{j}^{t}/N_{j}^{t}}$ and $C_{ij}^{t,s}$ and $M_{ij}^{t,s}$ are credibility parameters.

If j is the most recent injury year for which a direct experience frequency relativity estimate is available then the recursion starts with the direct experience estimate for injury year *j-3* and $\hat{R}_{ij-3|j-4}^{t,s} = \hat{R}_{ij-3|j-4}^{t-1,s}$.

The credibility parameters of [A.13] are determined using the following equations:

$$M_{ij}^{t,s} = 0.05 \times \left(1 - \min\left[\frac{N_{ij}^{t}}{3}, 1\right]\right) \quad \text{[A.14]}$$

$$C_{ij}^{t,s} = \left(0.05 - M_{ij}^{t,s}\right) + \left(X_{j}^{s} + V_{j}^{s} \times Proportion\ of\ total\ cost\ on\ accetped\ claims\ paid_{j,t}\right)\frac{N_{ij}^{t}}{K_{j}^{s}+N_{ij}^{t}} \quad \text{[A.15]}$$

where

$$X_{j}^{s} = \begin{cases} 0.45\ for\ injury\ year\ j \\ 0.50\ for\ injury\ year\ j-1 \\ 0.55\ for\ injury\ year\ j-2 \\ 0.60\ for\ injury\ year\ j-3 \end{cases}$$

$$K_{j}^{s} = \begin{cases} 0.40\ for\ injury\ year\ j \\ 0.35\ for\ injury\ year\ j-1 \\ 0.30\ for\ injury\ year\ j-2 \\ 0.25\ for\ injury\ year\ j-3 \end{cases}$$

$$K_{j}^{s} = 75$$

These equations have been chosen to exhibit the following desirable properties:

- The weight given to the direct experience estimate increases as the number of claims increases
- The less developed the injury year the less weight given to the direct experience component.

A.4 Practicalities

A.4.1 IBNR claims

N_{ij}^t is the estimated number of accepted claims incurred in injury year *j* at time *t*. It is estimated using the actual number of reported and accepted claims at time *t*, n_{ij}^tas follows:

$$N_{ij}^t = n_{ij}^t \times IBNR_{j,t} \quad [A.16]$$

where $IBNR_{j,t}$ is a pool wide IBNR factor for injury year *j*.

Previously we defined $R_{ij}^{t,f}$ as

$$R_{ij}^{t,f} = \frac{N_{ij}^t/W_{ij}^t}{\sum_k N_{kj}^t/W_j^t} = \frac{n_{ij}^t \times IBNR_{j,t}/W_{ij}^t}{\sum_k n_{kj}^t \times IBNR_{k,t}/W_j^t} = \frac{n_{ij}^t/W_{ij}^t}{\sum_k n_{kj}^t/W_j^t} \quad [A.17]$$

which suggests that the direct experience estimate for claims frequency can ignore the IBNR component without changing the results. A similar result is obtained for the direct experience estimate of average claim size;

$$R_{ij}^{t,s} = \frac{C_{ij}^t/N_{ij}^t}{C_j^t/N_j^t} = \frac{C_{ij}^{t,a}/n_{ij}^t}{C_j^{t,a}/n_j^t} \quad [A.18]$$

where $C_{ij}^{t,a}$is the lifetime cost of accepted claims and it is assumed that the average cost of accepted claims is equal to the average cost of IBNR claims.

A.4.2 Bonus/penalty amounts

If the Prescribed Amount is calculated using [A.1] at time *t-1* using $\hat{R}_{ij|j-1}^{t-1}$ then the final premium is calculated in the same way but replacing $\hat{R}_{ij|j-1}^{t-1}$ with $\hat{R}_{ij|j-1}^{t}$.

A.4.3 Allowing for scheme departures and new entrants

The recursive equations ([A.7] and the corresponding frequency and size analogues) need to be decomposed into two steps to allow for the impact of scheme departures and or new entrants to the premium pool. The first step is to calculate:

$$\hat{r}_{ij|j}^t = \left(1 - Z_{ij}^t\right)\hat{R}_{ij|j-1}^t + Z_{ij}^t R_{ij}^t \quad [A.19]$$

with $\hat{R}_{ij|j-1}^t \; and \; R_{ij}^t$ determined using the (estimated or known) wages for *j*. The second step involves setting

$$\hat{R}_{ij+1|j}^t = \hat{r}_{ij|j}^t \quad [A.20]$$

but then scaling the $\hat{R}_{ij+1|j}^t$ so that the weighted average relativity is 1 when the wages for *j+1* are suitably adjusted to allow for scheme departures and additions.

This process is slightly different to the one currently used by Comcare but the impact of the differences is small.

A.4.4 Timing delays

For practical reasons, the direct experience measures used in the recursive process are calculated with calendar injury years that finish six months prior to the corresponding financial premium year. Ideally this requires rebalancing of the direct experience relativities so that the weighted average direct experience relativity is one when the wages for the premium year are used.

APPENDIX B RECOMMENDED PREMIUM MODEL – TECHNICAL SPECIFICATION

B.1 General Approach

Calculate the *incurred cost rate for the employer* (*ICR*) as the weighted average total lifetime cost of accepted claims per unit wages for the employer over the responsibility period:

$$ICR_{it} = 0.25\, C_{ij}^{t}/W_{ij}^{t} + 0.25\, C_{ij-1}^{t}/W_{ij-1}^{t} + 0.25\, C_{ij-2}^{t}/W_{ij-2}^{t} + 0.25\, C_{ij-3}^{t}/W_{ij-3}^{t} \quad [B.1]$$

where:

C_{ij}^{t} is the lifetime cost of accepted claims for agency *i* in injury year *j* at time *t*

W_{ij}^{t} is the wages for agency *i* in financial year *j* known (or estimated) at time *t*.

Define the direct experience estimate of the *risk relativity for agency i* (the raw relativity of employer *i*) at time *t* to be:

$$R_{it} = \frac{ICR_{it}}{\sum_k ICR_{kt} W_{kj}^{t}/W_{j}^{t}} \quad [B.2]$$

where W_{j}^{t} is the total pool wages and ICR_{it} is as defined in [B.1].

Note that in practice the incurred cost rate for the employer may be calculated using experience and wages based on calendar years ending six months prior to the start of the corresponding financial premium year. However the wages used in [B.2] should relate to the relevant financial year.

The *risk relativities for agency i* are assumed to be generated by the following random process:

$$R_{it} = r_{it} + \vartheta_{it} \quad [B.3]$$

for some parameters r_{it} and random disturbance ϑ_{it} with $E[\vartheta_{it}] = 0$ such that

$$E[R_{it}] = r_{it}\,. \quad [B.4]$$

Then using a process analogous to that described in Section A.4.3:

$$\hat{r}_{it|t} = (1 - Z_{it})\hat{R}_{it|t-1} + Z_{it}\, R_{it} \quad . \quad [B.5]$$

Now set

$$\hat{R}_{it+1|t} = \frac{\hat{r}_{it|t}}{F} \qquad [B.6]$$

where *F* is defined by

$$F = (\sum_k W^t_{kj+1} \hat{r}_{it|t}) / W^t_j \quad . \qquad [B.7]$$

The factor *F* is how much the pool premium rate would change from *j* to *j+1* allowing only for the changes in wages and risk relativities between *j* and *j+1*.

For employers joining the scheme mid-way through the responsibility period then the *ICR* used in [B.2] are calculated only over the periods the employer was a pool member.

The credibility factor Z_{it} is calculated according to

$$Z_{it} = \frac{\bar{W}_i \hat{R}_{it|t-1}}{\bar{W}_i \hat{R}_{it|t-1} + K} \qquad [B.8]$$

subject to a minimum value of 0.1 where:

$\bar{W}_i$ is the average payroll for the employer during the responsibility window

K is set to a value of \$50M for the 2015/16 premium setting year. This parameter should be adjusted in line with wage inflation.

The premiums for each employer are then calculated according to [A.1]:

$$\frac{P^t_{ij+1}}{W^t_{ij+1}} = \frac{P^t_{j+1}}{W^t_{j+1}} \hat{R}_{it+1|t} \quad . \qquad [B.9]$$

B.2 Simplified presentation

Combining [B.5], [B.6] and [B.9] gives:

$$\frac{P^t_{ij+1}}{W^t_{ij+1}} = [\hat{R}_{it|t-1}(1 + Z_{it}\left(\frac{R_{it}}{\hat{R}_{it|t-1}} - 1\right)] \times \frac{1}{F} \text{ x } \frac{P^t_{j+1}}{W^t_{j+1}} \qquad [B.10]$$

Also [B.9] implies that:

$$\hat{R}_{it|t-1} = \frac{P^{t-1}_{ij}}{W^{t-1}_{ij}} \times \frac{W^{t-1}_j}{P^{t-1}_j} \quad . \qquad [B.11]$$

Combining [B.10] and [B.11] gives:

$$\frac{P_{ij+1}^{t}}{W_{ij+1}^{t}} = \frac{P_{ij}^{t-1}}{W_{ij}^{t-1}}(1 + Z_{it}\left(\frac{R_{it}}{\hat{R}_{it|t-1}} - 1\right)] \times \frac{1}{F} \text{x} \frac{P_{j+1}^{t}}{W_{j+1}^{t}} \times \frac{W_{j}^{t-1}}{P_{j}^{t-1}}$$

$$= \frac{P_{ij}^{t-1}}{W_{ij}^{t-1}} \times Performance\ Adjustment \times Pool\ Trend \qquad [B.12]$$

with:

$$Performance\ Adjustment = (1 + Z_{it}\ (Performance\ Ratio - 1)] \qquad [B.13]$$

$$Pool\ Trend = \frac{1}{F} \times \frac{P_{j+1}^{t}}{W_{j+1}^{t}} \times \frac{W_{j}^{t-1}}{P_{j}^{t-1}} \quad . \qquad [B.14]$$

$$Performance\ Ratio = \frac{R_{it}}{\hat{R}_{it|t-1}} \quad . \qquad [B.15]$$

From [B.15], [B.2] and [B.11]

$$Performance\ Ratio = \frac{ICR_{it}}{Benchmark\ incurred\ cost\ rate\ for\ the\ employer} \qquad [B.16]$$

with

$$Benchmark\ incurred\ cost\ rate\ for\ the\ employer = \frac{\sum_k ICR_{kt} W_{kj}^{t}}{W_{j}^{t}} \times \frac{P_{ij}^{t-1}}{W_{ij}^{t-1}} \Big/ \frac{P_{j}^{t-1}}{W_{j}^{t-1}} \quad . \qquad [B.17]$$

Note also that the *Pool Trend* [B.14] has two components:

- $\frac{P_{j+1}^{t}}{W_{j+1}^{t}} \times \frac{W_{j}^{t-1}}{P_{j}^{t-1}}$ which is the change in the pool premium rate between *j* and *j+1*
- F which is how much the pool premium rate would change from *j* to *j+1* allowing only for the changes in wages and risk relativities between *j* and *j+1*.

So if the change in the pool premium rate exactly matches that expected allowing only for changes in wages and risk relativities between *j* and *j+1* then the Pool Trend would be 1 (ie no trend).

APPENDIX C DESCRIPTION OF DATA USED FOR THIS REVIEW

The data provided for this analysis was provided by David Young of Young Actuarial Software & Services. This consisted of a notional version of the premium allocations from 2008/09 to 2015/16 based on claims experience data (past accepted numbers, claim payments and case estimates) restructured to reflect the current agency structure of employers in the Commonwealth premium pool. The purpose of this revised version of the past premium allocations was to create a test data set that was free of the complications caused by Machinery of Government changes and other complications such as mid-financial year employer departures or additions and wage estimate revisions.

The restructuring of the data was necessarily imperfect because the revision of claims data following a restructure only occurs over the four year responsibility window. Seven customers (C0062, C0385, C0389, C0393, C0669, C0670 and C0170) were assessed as being distorted by the restructuring process and these employers have been excluded from our assessments of model performance.

Comcare's current premium allocation model is implemented within proprietary software maintained by Young Actuarial Software & Services. We confirmed that we understood the workings of the current model by independently reproducing the notional premium estimates produced by the software.