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Game Theory and Australia's CTP Markets

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1 Summary

Compulsory third party motor insurance (CTP) is a highly regulated insurance environment. It provides insurers with a unique opportunity to operate in a large and transparent market. In such a market environment, insurers must understand the rules and understand their competitors' behaviour in order to determine their optimal strategy.

The community rating environment used for CTP is an unstable system in which insurers must be wary that they are not selected against. The insurance coverage that is provided is determined by statute and the pricing structure is transparent. Each vehicle owner must insure, and each insurer must accept any application for insurance. Consumers treat CTP as a commodity product and are quite price sensitive. This means that insurers face greater risk from a possible change in mix of business than from the uncertainty in actuarial estimates. Furthermore, the complexity of running CTP insurance operations means that there is a material level of fixed costs required to maintain the minimum skill set needed to be successful. This has led to a market in which prices are closely clustered.

Game theory is an economic theory of optimal behaviour in an environment in which economic agents are competing against one another. It can be applied to assist in such decisions as:

- allocation of the benefits of cooperation e.g. diversification benefits;
- choice of marketing activities;
- allocation of fixed expenses;
- underwriting;
- claim settlement; and
- market positioning.

The concept of bargaining power is central to game theory. When competitors benefit from your mistakes, your power lies in your ability to limit the options available to your competitor. In some situations the best option is co-operation. In such cases, your power lies in your ability to provide a benefit to others when they co-operate with you. These principles lead to strategies that don't just look at your own options, but force you to consider how your strategies affect your competitors, and what options they have available to respond to your actions.

Some of the conclusions that we make in this paper are consistent with common actuarial practice, but beware: some of the conclusions that come out of game theory require actuaries to lift their game! We explain how insurers in a soft market can find themselves trapped because they are worse off if they try to move rates to a sound basis. Our most startling conclusion is that it is sometimes dangerous to charge sound premiums. This can occur because sound premiums are set based on costs only, without reference to key features of market dynamics, such as what the market will allow you to charge, and what actions your competitors can take against you. Actuaries have the opportunity to add value by expanding their analysis beyond the cost-pricing approach, and modelling the implications of market dynamics.

While this paper purports to have three authors, we feel that Geoff Trahair should be acknowledged as a major contributor to this paper. When we sought out Geoff as a peer reviewer, we didn't realise that he was already well versed on the topic of game theory. His involvement has been much more time consuming and pro-active than the title "peer reviewer" would suggest.

2 Introduction

This paper looks at competition in the CTP markets in Australia. While all private sector states are covered, focus is primarily on NSW. Similarly, while different types of vehicle groups are mentioned, the focus is primarily on vehicles owned by individuals as opposed to businesses.

3 The Product

3.1 Introduction

CTP (Compulsory Third Party) insurance has been in existence in Australia since soon after World War II. It is viewed as so important by government that it is one of only three classes of insurance which are defined to be compulsory; that is all parties undertaking certain activities must buy insurance. The others are Workers Compensation and Builders Warranty insurance.

In Australia CTP is regulated at a state level. Of the eight states and territories, three are underwritten in the private sector (NSW, ACT and Queensland) and five in the public sector. All three private sector schemes are fault based.

3.2 What it covers

The coverage of CTP has been developed out of tort law and is designed to provide compensation to third parties as a result of the negligence of motor vehicle drivers in the operation of their vehicles. The compensation available and the mechanisms for obtaining it vary from state to state.

Essentially compensation is available to people injured by motor vehicles, excluding the at-fault driver. Compensation is available for:

- loss of income;
- medical and rehabilitation expenses;
- costs of necessary home and vehicle modifications;
- general damages (pain and suffering); and
- legal expenses

Since it derives from tort law, the at-fault driver receives no compensation as the main factor in receiving compensation is fault. Damage to the vehicles or other property damage is not covered.

3.3 Distribution

The process for purchasing CTP insurance is slightly different in each underwritten jurisdiction:

- In NSW the owner must produce a certificate of CTP insurance (a green slip) at the time they register their vehicle. The certificate must be purchased prior to registration from one of the six authorised insurers (who hold seven CTP licences between them).

The authorised insurers sell their policies through a variety of distribution methods such as over the phone, over the internet, via insurer branch offices, via banks, via insurance brokers, etc.

- In Queensland the CTP insurance is effectively part of the registration process; the CTP insurer is listed on the registration papers. The insurer may be changed either at or before the date of registration by the owner completing some paperwork, or will be renewed with the existing insurer if no election is made.
- In ACT, the CTP insurer is named on the registration papers. There is only one CTP insurer currently operating in the ACT, being IAG (trading as NRMA Insurance).

3.4 Government Supervision

The CTP insurers in the three underwritten states are overseen by a local authority:

- the Motor Accidents Authority in NSW (MAA) which overseas the Motor Accidents Compensation Act (MACA);
- the Motor Accidents Insurance Commission in Queensland (MAIC) which overseas the Motor Accident Insurance Act ; and
- the Department of Urban Services in ACT.

In each case the authority licenses the insurers and monitors their behaviour and performance. In Queensland MAIC also sets the possible range of premium rates, whereas in NSW and ACT the authority only rejects or does not reject the rates filed by the insurers.

3.5 Product Differentiation

The CTP markets are distinguished by the products being nearly identical. The only differentiation available is the addition of ancillary benefits such as benefits for the driver at-fault. This means that product comparison from the customer's point of view is reduced to

- price;
- ease of purchase;
- other product discounts dependent on holding a CTP Policy; and
- perhaps brand.

There is a recent increase in NSW in the offering of Driver At-fault cover, but this has occurred in the past and may not be a permanent feature of the products. These covers provide some compensation for some injuries to the at-fault driver, but are provided at no additional cost to the policyholder and the cover provided is at a fairly minimal level. In any case this benefit is likely to be of very low value to the customer as CTP is seen by most motorists simply as a component of the registration price.

3.6 Underwriting

Since CTP is a statutory class, the premise on which it is sold is that it must be available to all at a reasonable cost. This usually means that some groups of "high risk" insureds are subsidised by other insureds. This principle of community rating is a common feature of compulsory insurance schemes. The consequence of the price becoming excessive for any sector is that there will be an increased proportion of vehicles from that sector which are unregistered and thus uninsured, which is socially undesirable. The consequence of

these objectives is that only limited underwriting is possible. No proposal can be refused and prices can only be varied to a limited extent.

3.6.1 Back Door Underwriting

In the past some insurers in NSW have used unusual marketing practices to bias their portfolio mix to more profitable customers thus undermining the community rating aspect of CTP. In NSW the "MAA Market Practice Guidelines" were introduced to restrict many of these practices. The current guidelines, commencing 1 August 2006, are attached in Appendix A for interest. Briefly they:

- Mandate the requirement to provide a CTP quote or a CTP policy to anyone who asks;
- Acting promptly and efficiently in relation to the issuing of CTP policies, thus limiting the practice of issuing profitable risks early to encourage early renewal and underpriced risks late so they would consider renewing with another insurer;
- All individual proposers being treated in the same manner without discrimination in the issuance and payment of policies. There is
  - no prioritisation on handling callers;
  - no forcing different modes on payment on different segments (eg payment over the phone vs branch); and
  - no deterrence of customers by advising other insurers have cheaper rates or alternatively that there is a young driver excess.

3.7 Pricing

The pricing of CTP insurance in each state is based on the broad risk characteristics of the motor vehicle population. In each territory prices vary by type of vehicle, and then may vary by a number of other risk factors. Prices are reassessed at least annually in NSW and quarterly in Queensland.

3.7.1 Queensland

In Queensland there is no flexibility in pricing at all within vehicle class so a given type of vehicle is charged the same premium (subject to ITC entitlement) regardless of the nature of the owner or its location within the state. Each quarter the Motor Accidents Insurance Commission (MAIC) issues floor and ceiling prices for each class. Insurers then determine their own price within this range for each class. Once prices have been declared by each insurer, they cannot be varied for the duration of the underwriting quarter. The following table shows the vehicle classes and the range of in which insurers must choose the single rate to apply to that class for the first quarter of 2007. Looking down the classes the premium rates appear to reflect the relative riskiness of the classes.

Queensland CTP Vehicle Class Filing Floors and Ceilings

Effective for Premium Filings due 23 October 2006 in relation to premiums effective from 1 January 2007

Class	Class Description	Floor $	Ceiling $
1	Cars and station wagons	201	262
2	Motorised homes	201	262
3	Taxis	2831	3805
4	Hire vehicles	522	693
5	Vintage, veteran, historic or street rod motor vehicles	43	51
6	Trucks, utilities and vans 4.5t GVM or less	230	301
7	Trucks, utilities and vans more than 4.5t GVM	731	975
8	Buses: charitable, community service, driver tuition, not otherwise for business or commercial use	249	328
9	Buses: school, therapy, rehabilitation, remedial or special education	249	328
10	Buses: not class 8 or 9 but used within 350 km of base	350	400
	Per seat	45	64
11	Buses: not class 8, 9 or 10	350	450
	Per seat	37	50
12	Motorcycles: for driver only	57	70
13	Motorcycles: with pillion passenger/sidecar	166	215
14	Tractors	49	58
15	Self-propelled machinery or equipment, fire engines, bush fire brigade and other emergency vehicles	127	164
16	Ambulances	240	316
17	Primary production vehicles	118	152
19	Motor vehicles conditionally registered - limited access	49	58
20	Motor vehicles conditionally registered - zoned access	49	58
21	Self-propelled machinery other than a vehicle of class 14, 15, 19 or 20	66	82
22	Unregistered vehicle permits (base plus $1.10 per day)	40	46
23	Dealer's plate issued	201	262
24	Supplementary trailer insurance including Federal/Interstate	57	70

3.7.2 NSW

In NSW, insurers are free to vary their prices at any time by filing a new set of prices with the Motor Accidents Authority (MAA). A filing must be done at least once a year. Each filing must be supported by a report from an actuary external to the insurer certifying the adequacy of the premium rates (the fully funded test).

Once a base price has been determined, prices are fixed for each vehicle class and major region by reference to a table of premium relativities issued by the MAA. Around these fixed prices insurers are allowed to vary their price by a reduction of up to 15% (25% if the owner is over 55 years old), or an increase of up to about 50%, based on any objective criteria except race, location within region and ITC status.

Owners of vehicles who have a full or partial ITC entitlement are charged a higher premium, as their entitlement means that insurers are not allowed to claim an ITC/DA on claims on these policies.

The current table of premium relativities follows. Again the relativities follow closely the underlying risk characteristics.

Table of Relativities from 1 April 2007 to 30 September 2007

Vehicle Class	Region				
	Metropolitan	Outer Metropolitan	Newcastle/Central Coast	Wollongong	Country
1	100	84	79	96	75
3c	120	82	88	101	72
3d	299	203	227	227	127
3e	638	394	487	487	373
5	90	49	45	45	57
6a	1008	370	472	708	322
6b	132	114	106	120	104
6c*	1833	0	0	0	0
6d	100	84	79	96	75
6e	100	84	79	96	75
7	1089	572	1089	1089	572
8	100	84	79	96	75
9a	315	293	293	293	293
9d	132	90	97	111	79
9e	329	223	250	250	140
9f	702	433	536	536	410
10a	104	95	100	100	74
10b	42	35	34	38	28
10c	20	20	20	20	20
11	250	0	0	0	0
12a	125	108	100	113	100
12b	40	20	20	23	20
13	140	98	112	126	85
14	80	69	64	69	62
15a	30	26	24	27	23
15c	485	191	165	165	165
17	250	230	250	250	200
18a	165	114	132	149	80
18b	30	30	30	30	30
18c	10	10	10	10	10
19	10	10	10	10	10
20	10	10	10	10	10
21	1800	0	0	0	0

* the range of relativities for State Transit Authority (Class 6c) is from 1560 to 2100.

A sample of the rating factors and the categories used by insurers is shown in the table below. Broadly speaking:

- Country and regional areas receive a greater discount than metropolitan areas;
- 18-24 are loaded heavily;
- 55-74 are discounted;
- 74+ years old drivers are loaded by some insurers;
- Customers with Third Party Property Damage policies are loaded compared to Comprehensive policyholders;
- Some insurers rate on vehicle risk with high risk sports cars and 4WD attracting a loading while luxury cars attract a discount;
- Loading for bad claims experience or NCB;
- Loadings for older cars;
- Loadings for company or organisation owned cars;
- Loadings for business vs privately owned cars;
- A loading for commercial use;

- A loading for someone who has committed two or more traffic offences in the last three years; and
- A loading for someone licensed for three years or less.

Geographical Area	**Metro** **Other Metropolitan** **Wollongong** **Newcastle/Central Coast** **Country**
Age of the youngest driver	**18-21** **22-24** **25-29** **30-54** **55-74** **>74**
Type of insurance other than CTP	**Comprehensive** **Third Party Property** **No insurance Policy**
Type of vehicle	**Normal** **High risk** **Luxury** **Large/Medium 4WD**
Number of claims made - at fault over the last 2 years	**0** **1** **2** **3**
Age of the Vehicle	**Less than 10 years** **11 years** **12 - 16 years** **17 years or more**
Ownership - Private vs Commercial	**Privately owned** **Company or organisation**
Use - Private vs Commercial	**Private** **Business**
Number of traffic offence committed over the last 3 years	**Less than 2 offences** **More than 2 offence**
No Claim bonus	**Rating 1 (>60%)** **Rating 2 (50% to 59%)** **Rating 3 - 4 (30% to 49%)** **Rating 5 -6 (> 30%)** **Without no claim bonus**
Number of accident - "at-fault" claims in the last 3 years	**Less than 5** **5 or more**
Number of years the youngest driver obtained Licence	**More than 3 years** **3 or less years**

4 The Market

4.1 Participants

4.1.1 NSW

When CTP insurance was privatised in 1989 13 insurers were granted licences to operate in the market and were allocated market shares by the MAA. Since then, mergers and acquisitions have played the largest part in changing the market participants. Only one new player has ever entered the market, and eight have left, leaving the current six participants.

The seven licences (six insurers) are:

- AAMI
- Allianz
- Allianz(CIC)
- GIO
- NRMA
- QBE
- Zurich

There are only six participating companies, as Allianz has two licences – one being the licence originally issued to CIC and the other to FAI; both acquired in an acquisition from the failed HIH. This allows Allianz the advantage of setting different premium rates for the same segment in its two portfolios.

Allianz and Zurich are overseas listed insurers operating in the Australian market. The other insurers are all locally listed companies.

The impending merger of Promina and Suncorp will further increase the concentration in this market with Suncorp owning the GIO and AAMI brands. This will reduce the effective number of insurers to five.

4.1.2 Queensland

In Queensland there are six underwriters:

- AAMI
- Allianz
- NRMA
- QBE
- RACQ Insurance
- Suncorp

Suncorp has a significant share of the market and with the impending acquisition of Promina (operating as AAMI) it will have around a 58% share of the market.

4.2 Market Share of Players

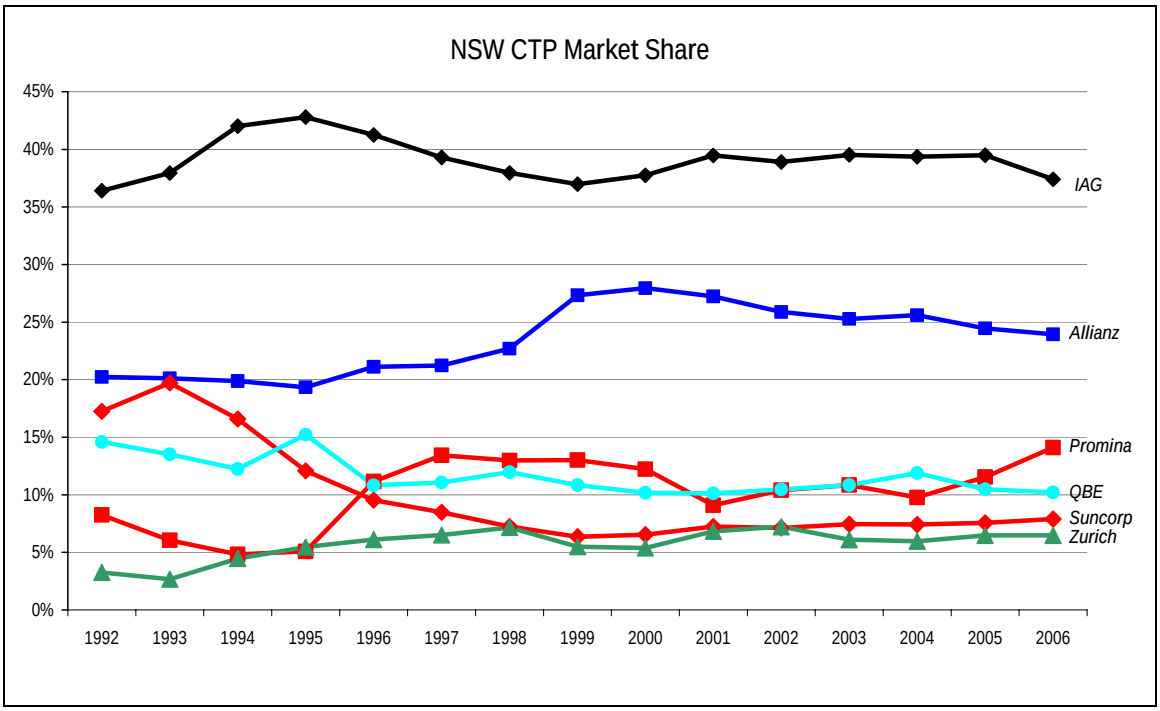
4.2.1 NSW

The NSW market shares by premium at June 2006 are shown in the following table. IAG has the leading market share followed by Allianz and Promina.

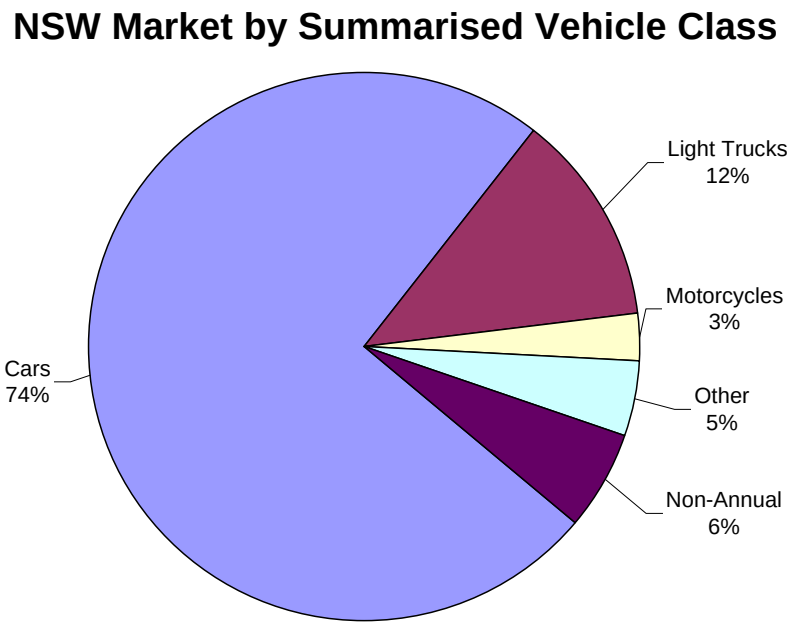
Company	Market Share
Promina (AAMI)	14%
Allianz	24%
Suncorp (GIO)	8%
IAG (NRMA)	37%
QBE	10%
Zurich	6%
Total	**100%**

*** At June 2006**

In NSW the market shares by player over time are shown in the following graph. Allianz has steadily lost market share over the last seven years. Other players have shown mixed results. Promina has shown strong growth over the last two years following an aggressive marketing campaign.



The following graph summarises the NSW market by major vehicle class. This is shown to indicate that cars are the major market, but commercial vehicles (particularly light trucks) could be considered an important separate market.



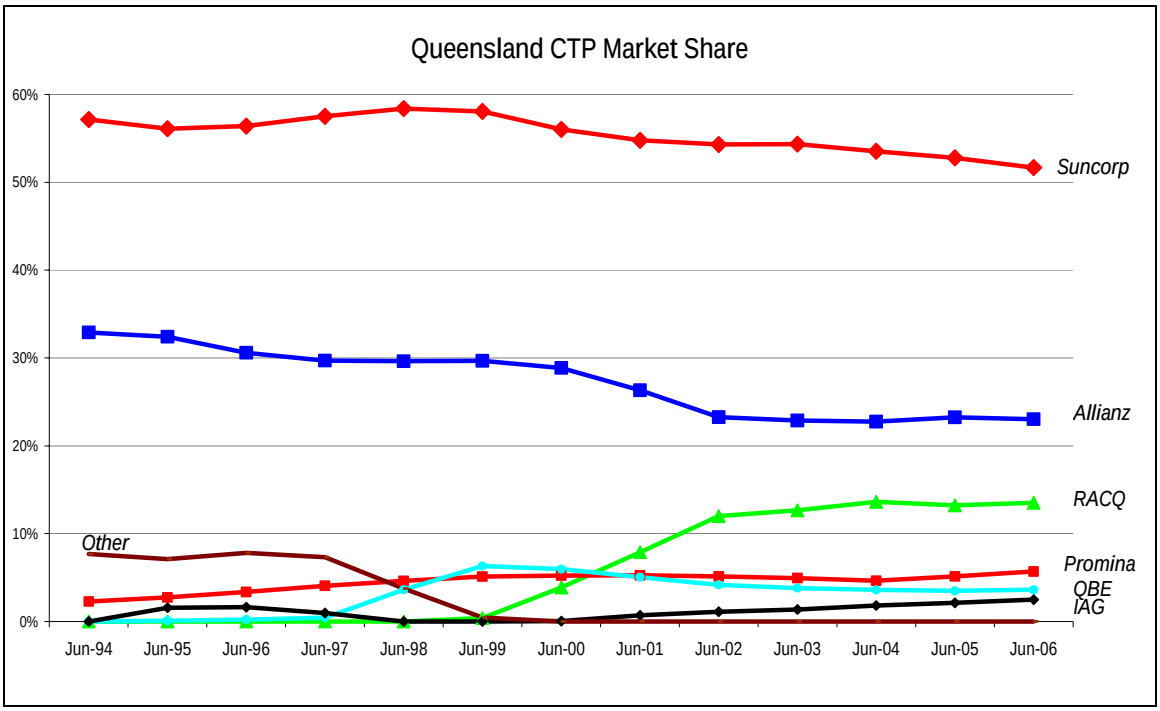
4.2.2 Queensland

The Queensland market shares at June 2006 by premium are shown in the following table. Suncorp has the leading market share followed by Allianz and RACQ.

Company	Market Share
Suncorp	52%
QBE	4%
AAMI	6%
Allianz	23%
RACQ	14%
NRMA	2%
Total	**100%**

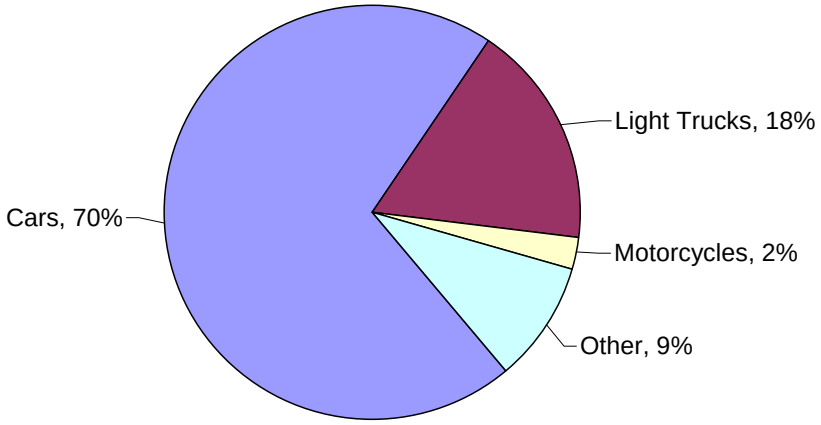
*** At June 2006**

In Queensland the market shares by player over time are shown in the following graph. Suncorp, Allianz and QBE have steadily lost market share over the last seven years. RACQ has grown strongly while IAG and Promina have shown moderate growth.



The following graph summarises the Queensland market by major vehicle class.

Queensland market by Summarised Vehicle Use



4.3 The Regulatory Environment

4.3.1 The State Based Market Regulator

The CTP insurance environment is heavily regulated. The failure of HIH resulted in a significant cost to the NSW and Queensland schemes through the FAI and the CIC brands. The market regulators are likely to be much more cautious in the future in allowing new entrants into the market.

The regulator requires actuarially supported filings in NSW at least once a year and quarterly filings in Queensland.

Tort reform and legislative change has had beneficial effects on the costs of claims emerging from the schemes. Restrictions on general damages and legal costs have resulted in lower costs emerging from both schemes.

While regulators demand that CTP prices be fully self supporting ie that they bear their full share of corporate overheads as well as their own costs, regulators have not gone as far as forcing insurers to hold separate statutory funds for CTP business.

4.3.2 APRA

Following the failure of HIH in 2000 APRA has been given unprecedented powers and controls. Market participants have advised that this has led to a significant cost in meeting compliance. The regulator requires, to name a few:

- Quarterly and Annual reporting;
- Site visits;
- Compliance with prudential standards around – Outsourcing, Reporting, Risk Management, Fit and Proper etc;
- Capital in the form of risk margins to provide a 75% probability of adequacy;
- Approved actuary roles providing Insurance Liability valuations and Financial Condition Reports; and
- External Peer Reviews of Insurance Liability valuations.

APRA also approves the Approved Actuary and the Approved Auditor and also can prevent or restrict insurance professionals from practising by imposing bans.

No one could argue with the fact that the APRA reforms have increased the security in the industry. From an actuarial perspective, this has been achieved partly through mandated insurance liability provision requirements above central estimates and the recognition of unprofitable business early through premium liability estimates.

4.3.3 ACCC

The ACCC are the competition authority and their recent approval of the Suncorp Promina merger has indicated that they believe the insurance market is adequately competitive. The merger will give a significant concentration in the personal insurance market in NSW and particularly in Queensland. This behaviour by the regulator perhaps indicates that they are more accommodating than they have been in the past.

4.3.4 ASIC

The Australian Securities & Investments Commission enforces and regulates company and financial services laws to protect consumers, investors and creditors.

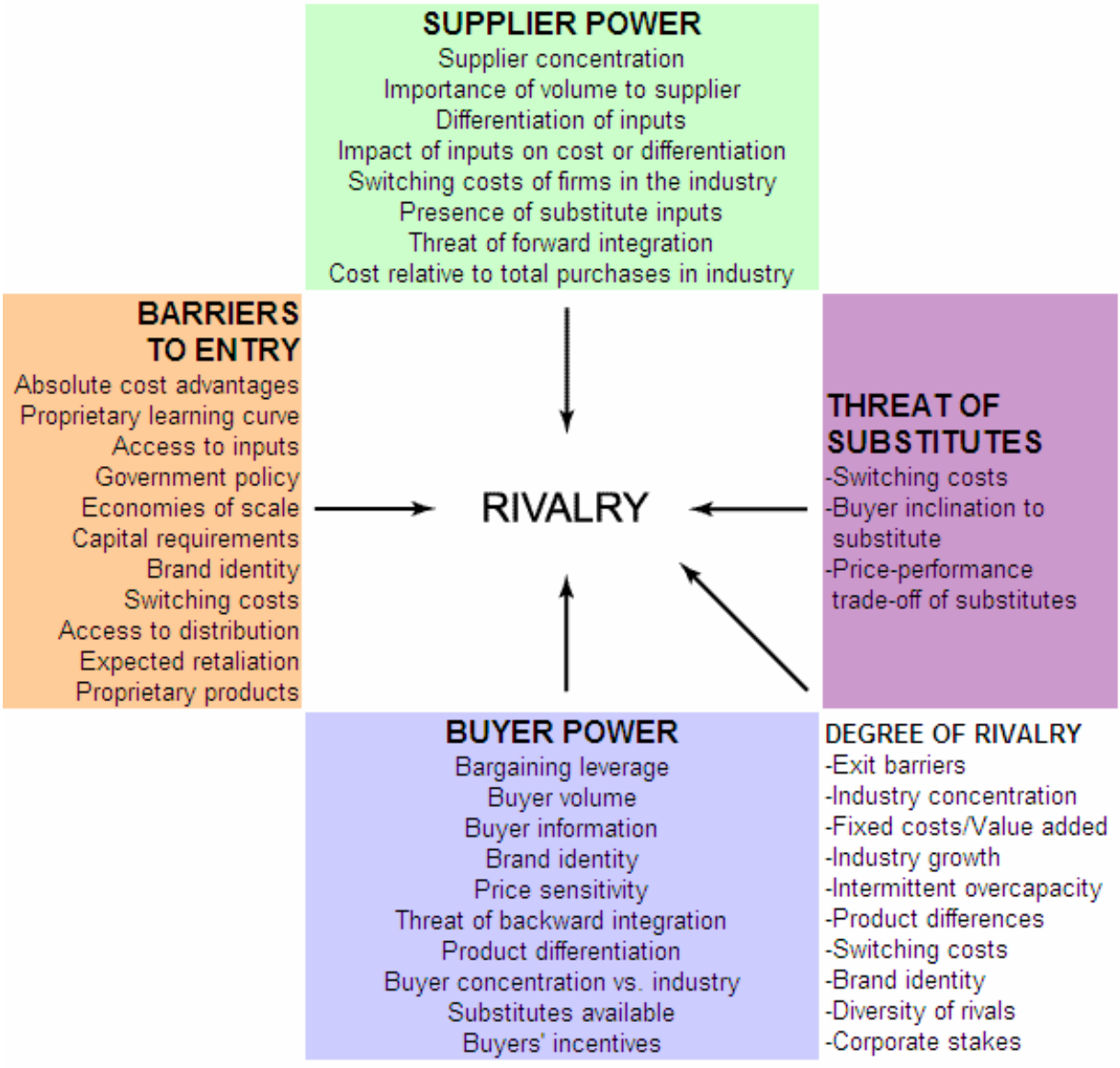
They regulate corporations and seek out those companies and individuals that breach the provisions and litigate and impose penalties and reporting requirements.

5 Industry Analysis

This paper is focused around game theory and it is important to understand the CTP market game. A useful framework to analyse the playing field is the Porter Five Force model which diagnoses industry structure. Porter identified five forces that drive competition within an industry which are:

1. the threat of entry of new competitors;
2. the bargaining power of suppliers;
3. the bargaining power of buyers;
4. the threat from substitute products; and
5. the intensity of rivalry among competitors.

The stronger these five competitive forces are means the greater the erosion in long-term industry average profitability. The following diagram summarises the model.



Source: http://www.quickmba.com/strategy/porter.shtml

5.1 Entry Barriers

This section looks at various aspects of the CTP market structures in order to assess whether these have a significant effect on the way the market operates.

5.1.1 Regulation and Capital

The CTP markets have strong barriers to entry. These include the high fixed costs and capital requirements associated with running a CTP business including cost of compliance with regulation (see 4.3 above).

APRA also imposes capital requirements which can be easily of the order of 20% of the net premium liabilities to meet a 75% probability of adequacy. In a growing portfolio which takes over six years to mature the impact of trying to support such a large margin which is can be double the target profit margin can be crippling. CTP gobbles capital for a long time so only the major insurers have the capital resources to write CTP.

A contrary view by some analysts suggests that the regulation will increase the attractiveness of insurance businesses in Australia as it has increased the confidence in the security of the industry. For an incoming player they can be reassured that significant underpricing can only ever be short lived under the APRA regime. The decreased number of players in the market will likely result in profits increasing due to reduced competition. Excess profit attracts new entrants.

5.1.2 Economies of Scale

The total premium collected must exceed the claims costs generated and the expenses incurred in running the business. Fixed costs are significant so there is a minimum size for a business to cover the fixed costs and become viable. That is, there is a need to be able to reach a size that will cover the substantial fixed expenses in running the business.

Fixed expenses include: actuarial costs, costs of complying with APRA regulation, MAA, advertising to build presence, maintaining the targeted sales structure (which may well be different from the remainder of the business).

The size of the Australian market means that a significant market share needs to be gained to reach the scale required.

The ACT market is a small market and the viability of entry into that market is questionable at this time, as an entire infrastructure would have to be set up by the entering insurer, with no starting customer base.

5.1.3 Proprietary product differences

There are negligible cover differences as the product is defined by legislation and the additional driver protection benefit are viewed as having little value. Thus there is no barrier to entry from this source. However, the major personal lines insurers have been attempting to bundle CTP together with other products by offering lower prices for CTP if the insured also holds comprehensive motor, and offering discounts on comprehensive motor if the insured also holds CTP.

5.1.4 Brand identity

Price is important in CTP, but it appears players in the private sector market can charge a premium for brand. This is indicated by the growth in the RACQ in Queensland and the strong market share held by IAG in NSW. It is also indicated by the difficulty that IAG has in getting into the Queensland market even though it tends to be a low price player.

Thus having a little known brand appears to be a barrier to success.

5.1.5 Switching costs

There are low switching costs in NSW as it only takes a phone call to find out a price and change insurers, though a renewal will be issued the next year from the incumbent insurer. The market is thus relatively fluid. Inertia does exist from customers who don't bother shopping around. Also some insurers offer other product discounts which depend on holding a CTP policy which may pose a barrier to switching, being the cost of the discount.

In Queensland the barrier to switching insurers is the relative ease with which renewal with the existing insurer takes place. In order to switch insurers, a written insurer nomination form must be sent to Queensland Transport. In order to renew with the existing insurer, effectively no action needs to be taken.

Consequently there is a significantly lower switching rate observed in Queensland than in NSW. Thus the NSW market has fewer barriers to entry than Queensland from a customer switching perspective.

5.1.6 Access to distribution

There are six major distribution sources:

- Telephone
- Internet
- Insurer Branch
- Broker/Agent
- Car Dealer
- State Based Motor Authority

In NSW the first five apply as the state based motor authority only checks whether a green slip has been purchased at the point of registration.

In Queensland the issuance is with the motor authority. Payment is made through the motor authority. In theory every insurer should have equal opportunity to get business, but brand, cross product discounts and the inability to get nominations limits this. The other channels provide opportunities for insurers to market to customers to change insurers and fill in a nomination form. Thus exposure to these channels may increase the opportunity to build market share.

The motor dealer channel is an important channel in both states which has strong bonds with three insurers - Suncorp, Allianz and IAG.

5.1.7 Absolute cost advantages

Almost all the insurers in the CTP segment are quite large though it could be argued that IAG, Suncorp and Allianz have the largest CTP portfolios which allow for greater expense per policy advantages.

In respect of the claims cost per policy (ie the ability to manage claims more effectively to get a better outcome) there is no public evidence to suggest one insurer is consistently better than another in this regard. Some would argue that policy selection is more important than claims management.

5.1.8 Proprietary learning curve

Does any insurer have any significant proprietary learning in this segment that would disadvantage a new player? Given that underwriting acceptance is compulsory, the only areas are likely to be related to claims management and risk selection through targeted marketing and advertising. Claims managers can be bought from other insurers or moved internally for a company with other liability portfolios so this is a low barrier. Advertising is highly visible and can be easily replicated so this is not a barrier.

Insurers with an existing motor insurance customer base entering the CTP market have a portfolio of customers they can directly market to. Without this a company will have difficulty in exploiting existing relevant customers or cross selling related products. Thus not having an existing customer base is a significant barrier.

Similarly in the corporate CTP market, established contacts with the relevant distributors (fleet managers, insurance brokers) will offer a distinct advantage to existing participants.

5.1.9 Access to necessary inputs

As insurance is largely a service product, access to inputs is largely people based.

Call centres are not very costly compared to branch set ups so this part is not a barrier.

It could be argued that in the current market with low unemployment, decreasing new entrants into the work force and a shortage of skilled labour, getting staff to handle claims with sufficient skills could be difficult to find or costly. As a result the costs of production may be high. This could provide a barrier as it may represent a significant start up cost.

The other major input is an IT system for storage of information and delivery of the product. With the new off the shelf server technologies this should not be a barrier to entry.

For an insurer requiring external suppliers to service the product such as lawyers, investigators and rehabilitation specialists, there are sufficient suppliers to support the company. Suitably experienced employees, such as actuaries or sales staff may be more difficult to find, but this is not insurmountable.

There are no strong barriers from the supply inputs.

5.1.10 Proprietary low-cost product design

The product is legislated and thus product design is significantly limited. Therefore this would not pose a barrier.

5.1.11 Government policy

The MAA maintains guidelines for CTP licence applicants. These mainly relate to the physical ability of the applicant to properly operate in the CTP market – they "must have the necessary infrastructure, financial and other resources". They also require the applicant to become a party to the Industry deed covering sharing of claims.

5.1.12 Expected retaliation

A new entrant into the market is unlikely to experience initial significant retaliation as the major source of retaliation is through pricing. Also the regulator places constraints on prices through actuarial certification in NSW and floor and ceiling prices in Queensland. It appears that in Queensland price led competitiveness can only build market share slowly due to brand loyalty. This is evidenced in NRMA's and QBE's low growth in the Queensland market. In NSW this should not be the case, but has not been tested as there have been no new entrants to the market since 1991. Retaliation from competitors in the Queensland market appears not to have been great.

The difficulty with price led competition is that there is a different elasticity of demand between good risks and poor risks – generally poorer risks will switch insurers for a lower price differential than good risks. Thus any price led competition is likely to result in a deteriorating portfolio mix for the aggressor, at least initially.

5.2 Determinants of Supplier Power

This section looks at the various suppliers of resources to the CTP insurance process and their effect on the market competitiveness.

5.2.1 Differentiation of inputs

The inputs into the process of producing the service provided by CTP insurance are made up of:

- staff to service the policyholder and claimant;
- the system that stores the information and issues the policies and notices of coverage; and
- external claims service providers.

Experienced staff may be more costly to obtain but they as a whole will have low power.

Most insurers maintain their claims management internally while outsourcing services such as legal advice, investigation and rehabilitation. There are so many of these service providers that it could be argued that the service provision is highly commoditised. The size of the insurer typically swamps the size of these suppliers. They are unlikely to have any power as they strongly desire the steady flow of work from an insurer and thus are in a weaker negotiating position.

The insurer has power which comes from the fact that it has large scale and may be able to yield a better expense rate.

There are no significant supplier power issues in this market.

5.2.2 Switching costs of suppliers and firms in the industry

In switching suppliers there are no significant costs as there are many providers of what could be called generic services such as legal and rehabilitation. Suppliers are numerous and have a low concentration. However, they do need to have a demonstrated level of expertise in order to be credible.

5.2.3 Presence of substitute inputs

At this stage, the only widely used substitute inputs come from overseas based call centres. This is a small part of the cost of the product. Claims management is an intensive process for bodily injury claims involving dealing with external claims service providers on a regular basis for a long time and cannot easily be substituted with overseas labour.

5.2.4 Importance of volume to supplier

Insurance business could be considered bread and butter business and securing such a contract can mean a long term stable cash flow stream coming from the ever occurring car accidents. For smaller to mid sized service providers an insurance contract is a great achievement and potentially they may provide better prices to insurers. Supplier power is thus low as power rests more with the larger insurers.

5.2.5 Cost relative to total purchases in the industry

Claimant awards are the major costs. Thus supplier costs are a low proportion and have a smaller effect on profitability.

5.2.6 Impact of inputs on cost or differentiation

Due to the variability in the claims cost it would be hard to determine precisely whether there is any impact on insurers' prices from differences in the cost of suppliers.

5.2.7 Threat of forward integration relative to threat of backward integration by firms in the industry

There is a greater threat that the insurers will bring in external services than suppliers setting up their own insurers. There are thus no major threats to profitability from suppliers.

5.3 Determinants of Buyer Power

5.3.1 Bargaining Leverage

There are two major buyer markets. These are the individual customer and the motor dealer or the fleet owner.

5.3.2 Buyer concentration versus firm concentration

The CTP market from an insurer perspective is very concentrated. As at June 2006, the top four insurers controlled 86% of the market in NSW and 94% in Queensland. Thus there is a higher concentration in insurers than there are in the buyer market.

5.3.3 Buyer volume

Individuals have low bargaining power except through the lobbying for price changes through pressuring government which is a rare occurrence.

The dealer market has bargaining power and insurer incentives and personal relationships increase the cost of dealing with this sector.

Some special interest groups such as those representing buses have had success in lobbying the regulator and these should not be discounted.

5.3.4 Buyer switching costs relative to firm switching costs

Buyer switching costs are low in the personal insurance market as it involves either minimal paper work or a phone call.

In the dealer market, the product and pricing is standardised with no underwriting so there is low switching costs.

5.3.5 Buyer information /Price Transparency

Buyer information is readily available either by contacting an insurer or by looking at the MAA web site in NSW or the MAIC website in Queensland.

The CTP markets are almost what economists might call perfect markets:

- Customers are free to purchase from any insurer.
- The products are nearly identical so comparison is reduced to price alone.
- Price comparison is made simple as the MAA and the MAIC both offer price comparisons on their websites. Within five minutes anyone can have a complete view of the market prices for their circumstances, and the phone numbers to ring to make the purchase.

5.3.6 Ability to backward integrate

Individuals do not have the ability to create bargaining pools as the price is legislated. It could be argued that they could get the indirect benefits of commissions if sold through an amalgamator like a credit union or some other organisation that behaved like a dealer. On the other hand, some large fleets have reasonable bargaining power as rates can to some extent be experience rated.

5.3.7 Price Sensitivity

Generally it would be perceived that the market is very price sensitive and insurers cannot be too far away from the market price otherwise they lose business. This is indicated by the close grouping in prices in the NSW and Queensland Markets. That is, if price was not important, why would competitor prices be within 5% of each other? Refer to graphs in section 9.4.

5.3.8 The Buyer perspective

For the car buyer their CTP premium is not a significant cost out of their total purchase price, but has low value as it is effectively part of the registration process. The fact that the buyer will never be the claimant increases the commodity feature of the purchase.

There are no perceived product differences but brand does have an important influence on the purchase decision as mentioned earlier.

Insurers provide incentives to insureds to change insurers which include discounts on other products and perhaps opportunities to win items. In the dealer market those incentives are likely to be larger.

Thus there are no major threats to profitability from buyer power.

5.4 Rivalry Determinants

Due to the decline in the insurance cycle where market premium volumes have been decreasing coupled with the need for listed players to demonstrate top line premium growth, there has been increased rivalry among players.

The Queensland market continues to grow in real terms fuelled by net positive migration while NSW growth is slowing. The vehicle population growth has been of the order of 2.4% in NSW and 4.7% in Queensland (Source: ABS9309.0 - Motor Vehicle Census, Australia, 31 Mar 2006), so the market continues to grow which has a lower impact on rivalry. The fact that premium rates have decreased means that revenues in total are on the decline. This may have an impact on increasing the rivalry in this market.

Fixed costs are high in this market and any loss of premium volume means that insurers with scrutiny on the expense ratios are going to suffer some pain. This may lead to more aggressive competitive behaviour.

Products are viewed as largely generic which also increases rivalry.

Brand identity is important to the extent indicated by the failure of new players like NRMA to build market share in Queensland and also less known brands like the new Allianz brand (sourcing its business from FAI and CIC) which has a decreasing market share.

5.4.1 Switching Costs

There are generally low switching costs for policyholders so price is a key determinant.

5.4.2 Diversity of competitors

Competitors tend to be diversified into other classes of business. A loss in CTP market share is generally not critical as there are diversification benefits from other lines of business. This reduces rivalry. The one exception would likely be RACQ Insurance in Queensland which is concentrated in the Queensland state and only writes personal lines and CTP business.

5.4.3 Exit barriers

Barriers to exit include:

- APRA runoff capital requirements. This is only a problem if there are not other insurance portfolios with similar characteristics, such as public liability.

- The loss of cross selling opportunities and exposing your customers to competitors' brands. Aggressive expansion in the CTP market is probably an example of how insurers try to maintain their policy base in other lines.

These are weak barriers to exit and thus not a threat to profitability.

5.5 Determinants of Substitution Threats

There are no substitution threats as the regulator mandates the purchase of CTP as part of the registration process.

5.6 Conclusions

The following table summarises the bulk of the CTP market. Generally the CTP market is likely to remain profitable with the moderate identified threat coming from rivalry amongst competitors trying to build market share.

Force	**Threat to Profits**
Internal Rivalry	Medium
Entry	Low
Substitutes	-
Supplier Power	Low
Buyer Power	Low

6 Actuarial Controls

6.1 Pricing

Much of the pricing is driven by actuarial advice. This is logical given the fact that long tail class pricing is linked to the actuarial process of reserving, though some argue that this link is more tenuous than theory would prescribe.

This linkage is formalised in NSW in the rate filing process which requires an actuarial signoff for each insurer's rates. This was the first formalisation of the actuary's role in general insurance in Australia.

In NSW each insurer is required to file its proposed premium rates with the MAA prior to them being offered to the public. These rates must be supported by a certificate from an external actuary which states that the rates are sufficient to fully fund the risks being taken on, together with associated expenses and an adequate profit margin. The rates must also be accompanied by a certificate from the CEO of the insurer acknowledging their full knowledge and agreement to the proposed rates.

It is possible for an insurer to charge rates different from those certified by the actuary. In this case the CEO must state what assumptions the insurer has used to arrive at their rates and how these vary from the actuary's assumptions.

The effect of this process is that while the insurer must seek an actuary's advice, it is ultimately the insurer's decision what price to charge.

In Queensland and the ACT no actuarial sign off is required.

In Queensland, MAIC receives their own actuarial advice which is used to set the floors and ceilings each quarter. Currently actuarial consultants provide significant technical analysis quarterly into the determination of the claim frequency and claims cost for the Queensland scheme to guide MAIC in setting ceiling and floor prices, this coupled with internal company actuaries help guide prices. Actuarial sign off of each insurer's rates is not required.

6.2 Uncertainty and Lack of Information

Actuaries are well known for not reacting to one period of experience and require a number of data points to emerge before they acknowledge a trend. As a result prices tend to move up and down slowly.

Long tail classes are heavily reliant on assumptions which use small amounts of data with a high degree of uncertainty. This makes actuaries hungry for information to support their assumptions and, while Industry datasets are available, some of that information comes from general market views.

6.3 Consensus

Due to the nature of actuarial work with the current legislative requirements there is a plethora of actuarial interactions to which an actuary is potentially exposed. These

include a valuation actuary, an approved actuary, external audit with supporting actuary, actuarial external peer review and the actuarial industry scheme studies. This means that actuaries are bombarded with market assumptions and methods from a number of sources. As a result the actuarial valuation is likely to be heavily aligned with the consensus view in the market.

The consensus view appears to be encouraged within consulting firms who when called to defend an assumption in a legal arena may find it hard to justify why one actuary of the firm uses one assumption and another uses a different assumption, thus producing conformity as a risk management measure.

Actuarial consensus is perhaps also driven by the fact that if you choose an assumption and you are going to be wrong it is better to be as wrong as everyone else rather than be wrong on your own. This thought process is also widely seen in the investment management market.

These behaviours result in competitors' pricing moving in harmony and implies a reduced level of competition.

An example of this kind of behaviour followed the introduction of the Motor Accidents Compensation Act (MACA) in 1999 in NSW. While emerging experience was universally good, and below expectations, there was widespread doubt about how the system for arbitrating disputed claims (CARS) would work. There were significant delays with getting CARS up and running, and during this time actuaries advising insurers maintained considerable conservatism in pricing and reserving on the basis that CARS could be an avenue for claims costs to return to their pre-MACA levels. While this is all perfectly justifiable, this argument and approach was maintained as recently as 2005 and 2006, by which time MACA had been in place for six or seven years. This led to insurers producing significant levels of excess profits in the years from 2000 to 2005.

Coinciding with this period of conservatism in assumptions was a period of very low levels of competition in the NSW market. There was no concerted attempt by any insurer to significantly increase its market share and this did not change until 2005 when AAMI launched a broad advertising campaign, which has now been followed by other insurers.

In some ways, however, this consensus of actuarial thought can be a good thing within the CTP market. Conservatism can provide a stabilising influence that prevents the collapse of the system.

By enforcing community rating upon a line of insurance in which different policyholders have materially different claims cost profiles, governments are creating inherently unstable and chaotic systems for insuring motorists. Actuarial consensus provides limits to the amount by which each insurer's behaviour and results can differ from their peers. Without these limits, some insurers can act in ways that destabilise the system, such as finding ways to successfully avoid the more unprofitable policyholders. For example, the withdrawal of AMP from the NSW CTP market in the 1990s may be linked to their worsening mix of business and the market constraints that prevented them from rebuilding an "industry average" mix of business.

Consensus of actuarial thought allows implicit co-operation between insurers. This allows faster reaction times to emerging problems. For example, in the 1990s in NSW it only took 18 months for the market to recognise and react to emerging evidence of

problems with claims cost. This type of reaction speed is not possible in a market in which actuaries have more diverse opinions and there is no widespread industry data monitoring. On the other hand, the credit for this reaction speed may be more fairly centred upon the availability of detailed industry data, which prevented insurers from operating in ignorance of the claims costs being faced by other insurers.

It falls upon the actuary to balance the competing goals of stability of the scheme and affordability of premiums. Actuarial “group think” reflects the pressures of these competing aims. It gives considerable stability to an inherently unstable market (the market is unstable because of community rating) by discouraging maverick behaviour. It has enabled faster reactions to problems as they emerge. However it has slowed reactions to positive trends, which in turn has contributed to sustaining higher premiums and has only slowly rewarded the public for the lower frequency environment experienced in the past few years.

7 Pricing

7.1 Sound Premiums

The IAAust course notes for general insurance say that a sound premium "is the premium that is expected to provide the required rate of return on shareholders' funds". This definition of a sound premium is quite similar to cost-price plus adequate profit margin which is used as a definition of a "fully funded premium" in Guidance Note 351. Actuarial education would lead students to believe that if we charge a "sound" premium in every cell then we will be OK, but this is not the case. Each cell is made up of a number of sub cells eg Metro Class 1 drivers can be further categorised by age, experience, driving and accident record, vehicle type (all of which can be included in the rating structure) as well as other factors such as locality within region and ethnic origin (which are not). Different insurers will pick a selection of these to sort drivers within a cell into more approximately homogenous groups, but only with partial success. Insurers can't ask too many questions as customers and agents will not cooperate. The result is that most rating cells contain a reasonable amount of heterogeneity.

7.2 Bonus/Malus

The bonus / malus limitations mean that insurers are not able to charge "sound" rates for every risk. The CTP insurer's job is to write the better risks within each cell and minimise those which are so poor that the maximum malus is insufficient. They do this in an environment where other insurers are trying to do exactly the same thing. Better risks are written via a mixture of pricing and marketing strategies, and ensuring that prices relative to competitors are where they need to be ie higher than competitors for the worst risks and lower than competitors for the best risks.

7.3 Young Drivers

The key underwriting risk factor is age. Young drivers (under 25) are such poor risks that even at maximum malus they incur loss ratios well over 100%. Therefore the main focus of an insurer must be to minimise the proportion of these drivers. This is done by:

- Charging maximum possible prices and possibly sacrificing best possible prices in order to not have a price for young drivers which is the market's cheapest.
- Not marketing in a way that attracts them eg not in youth magazines, not encouraging transactions over the internet (though this is diminishing), etc.

The insurer that is the least successful at minimising young drivers will end up with the highest proportion of them, so strategy relative to competitors is paramount.

7.4 Unsound Premiums

Is it sensible to charge an unsound premium for a cell? It can be if competitors are also doing so. For example if the "sound" premium for a cell is $350, with the "sound" rate for the best risks being $300, and the market is charging $280 for the best risks in the cell, with various selection criteria, what will happen if the insurer prices at $300? They will not acquire the best risks. Instead they will acquire a selection of much worse risks for whom the correct "sound" premium is $400, so will return a worse loss ratio for charging a higher premium than the competitors who charged the lower premium. There is a complex interaction taking place due to:

- the heterogeneity of each rating cell
- the inability to charge fully for risk

Therefore the unsound premium may be a better choice. This is on the proviso that the insurer can deliver better than average risks and / or can charge excess premiums for other less attractive classes to make up the difference.

7.5 Cross Sell

A recent feature of the market is the desire to take on CTP risk and then use this to cross sell other products. CTP may not be overtly used as a loss leader as the Act requires a fully funded premium with proper allocation of expenses and corporate overhead. However, a highly competitive premium may be charged for CTP with a lower profit requirement on the understanding that all CTP customers will be actively cross sold other more profitable personal lines products eg Motor and Home.

7.6 Technical Pricing

In setting prices in NSW actuaries and insurers are required to file rates which are supported by a technical analysis. The Premium Determination Guidelines issued by the MAA ensure that insurers give consideration to:

- claim frequency;
- claim size;
- future payment patterns;
- inflation (both economic and superimposed);
- discount rates;
- expenses (claim management, acquisition, policy maintenance);
- business volumes;
- reinsurance costs and recoveries; and
- profit margins based on required returns on invested capital,

8 Policyholder Behaviours

Low retention rates – why does this happen? The CTP insurance follows the vehicle when it is sold, rather than staying with the owner. Thus around 23% of policies will transfer to a different policyholder each year.

This gives a greater instance and opportunity for customers to shift, and due to the commodity nature the motivation is often on price.

Policyholders are willing to move for a cheaper premium. This is facilitated by the fact that:

- Prices are relatively easy to get either by a phone call or access to an internet site
- Products are identical and thus treated as a commodity.
- The limited question set and technology make it very easy to change carriers.

Different groups of policyholders have difference levels of mobility and sensitivity to price differences. Some will move for $1.00. Others will not even make the comparison provided that their renewal premium is similar to last year's. Do these groups have different claim characteristics? Probably.

Our brief survey of market participants showed that they believed a $3 to $10 price difference was the likely price difference at which many people will switch insurers. This is very small when compared to other personal lines products where a $40 price difference is often quoted.

For some policyholders such as those in Country areas, ease of access to CTP policies will be the key driver of the purchase decision. This will lead to greater success for telephone credit card sales, sales through garages, etc

It could be envisaged that price sensitivities would vary by customer group. In NSW where differential rating is allowed it could be expected those higher premium individuals, the under 25s, are the most price sensitive which is perhaps linked to

- larger premium
- less availability of personal funds
- still haven't built a loyalty to any insurer

In the Queensland market where no zone or age differentiation is allowed these individuals could also be expected to have low retention rates due to all factors above except that of the larger premium (due to the community rating).

Other considerations of what drives policyholder behaviour may include brand, in that where price is similar, the stronger branded product may be perceived as better quality for a similar price.

Discounts for holding multiple product combinations, such as motor comprehensive and CTP also play an important part in the decision process as this makes customers more "sticky" in that they may fear losing a discount if they change CTP insurers.

Some policyholders may expect that holding multiple products with one insurer for a long period of time will result in more consideration at claim time; a reward for loyalty.

Favourable pricing experience in another product may lead to a switch in insurers. That is, if a new insurer to the customer can offer a significantly reduced premium, it may encourage the customer to check all their other insurances. This may destroy the trust in the incumbent insurer

Unfavourable claims experience with an insurer on non CTP products may force a change in insurer.

Identification with a particular brand is also important. If for example, “Virgin” was as an insurance brand in Australia, it may not appeal to older customers, whereas Australian Pensioners Insurance Agency do. For CTP players this is an important consideration due to the community rating aspect and the inability to load sufficiently for young drivers.

9 Competitor Behaviour

9.1 Oligopoly and a regulatory environment

According to Wikipedia –

> "An oligopoly is a market form in which a market or industry is dominated by a small number of sellers. Because there are few participants in this type of market, each oligopolist is aware of the actions of the others. Oligopolistic markets are characterised by interactivity. The decisions of one firm influence, and are influenced by the decisions of other firms. Strategic planning by oligopolists always involves taking into account the likely responses of the other market participants. This causes oligopolistic markets and industries to be at the highest risk for collusion."

This characterises it as a key market where game theory can be used as a tool to understanding and optimising behaviours.

Wikipedia continues:

> "As a quantitative description of oligopoly, the four-firm concentration ratio is often utilized. This measure expresses the market share of the four largest firms in an industry as a percentage. Using this measure, an oligopoly is defined as a market in which the four-firm concentration ratio is above 40%."

The CTP market is characterised by a high concentration as discussed above. As at June 2006, the top four insurers controlled 86% of the market in NSW and 94% in Queensland. It thus meets this definition of an oligopoly.

The CTP market has relatively high barriers to entry as discussed above. This means there are unlikely to be new entrants who will compete in the market and drive profits down by putting pressure on prices. By its nature an oligopoly should have lower prices than a monopoly but higher prices that a free competitive market. There is an implicit cost for community rating and long-term price stability.

The fact that prices are regulated also has an effect of increasing prices compared to a free market level. As competitors want a return in the long term and the government wants stability in prices, the compromise is generally a higher price than a natural competitive market. This lag in pricing is implicitly selling the government a trade off. This is that insurers will generally demand a premium in good times to offset the losses in bad times when they can not charge the true cost of production; that is they will not be able to change prices quickly enough to reflect increasing costs. Thus regulated pricing will generally yield higher prices than in a competitive market.

9.2 Positioning

The interaction with competitors is more important than technical rating, as incorrect positioning will result in the worse risks being collected and an underwriting result with which the premiums cannot cope. A company that positions itself either through advertising, marketing or discounts as an insurer of young individuals will suffer as the community rating aspect of CTP heavily but inadequately subsidises them.

It is thus important for a player to be aligned with customer segments in its other portfolios and businesses that meet at least something close to or better than the average population.

9.3 Long term profitability

CTP is a long term game. Due to the propensity for litigation in bodily injury claims there tends to be a cycle of scheme reforms to combat escalating costs which build up as users of the schemes demand and receive increasingly generous benefits. As reforms are introduced the costs initially reduce, but as precedents emerge and loopholes are found the costs begin to increase again. Once the costs reach critical levels new reforms are introduced. CTP reforms generally have retrospective effects regardless of their intentions due to behaviour and culture in the courts and in the general population. This means that results following reform years tend to be better than expected. When costs increase they tend to do so in big increments. The required premium increases to cover the period at risk can never be achieved in the short term due to regulatory controls coupled with the synchronised market behaviour and slow recognition of the cost increases. Being out of kilter with the market generally results in penalties of either loss of business or gaining of the price sensitive underpriced segments.

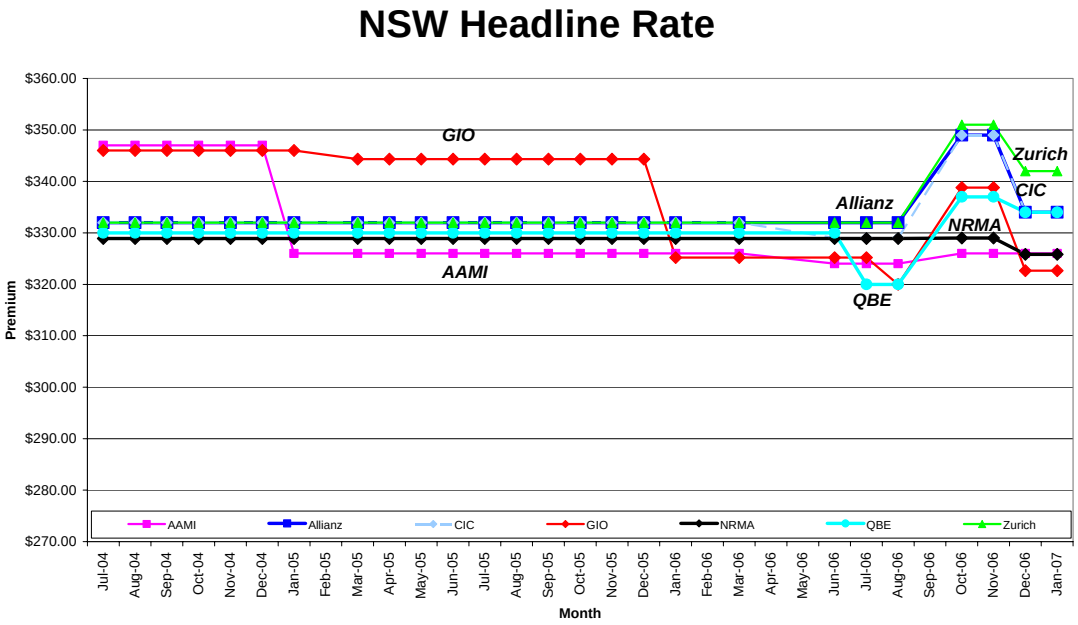
In the long term, provided the portfolio has an average mix of business it could be expected to yield a fair profit, particularly coupled with the regulated oligopoly issues discussed above. It thus pays to ride the cycle.

Exiting the market when results go bad means that the insurer's gearing to the underpriced years of business will be higher. As is sometimes the case the bad years get worse particularly with the gradually adaptive actuarial methods that are used not giving full weight to a trend until it has stabilised.

9.4 Price Clustering

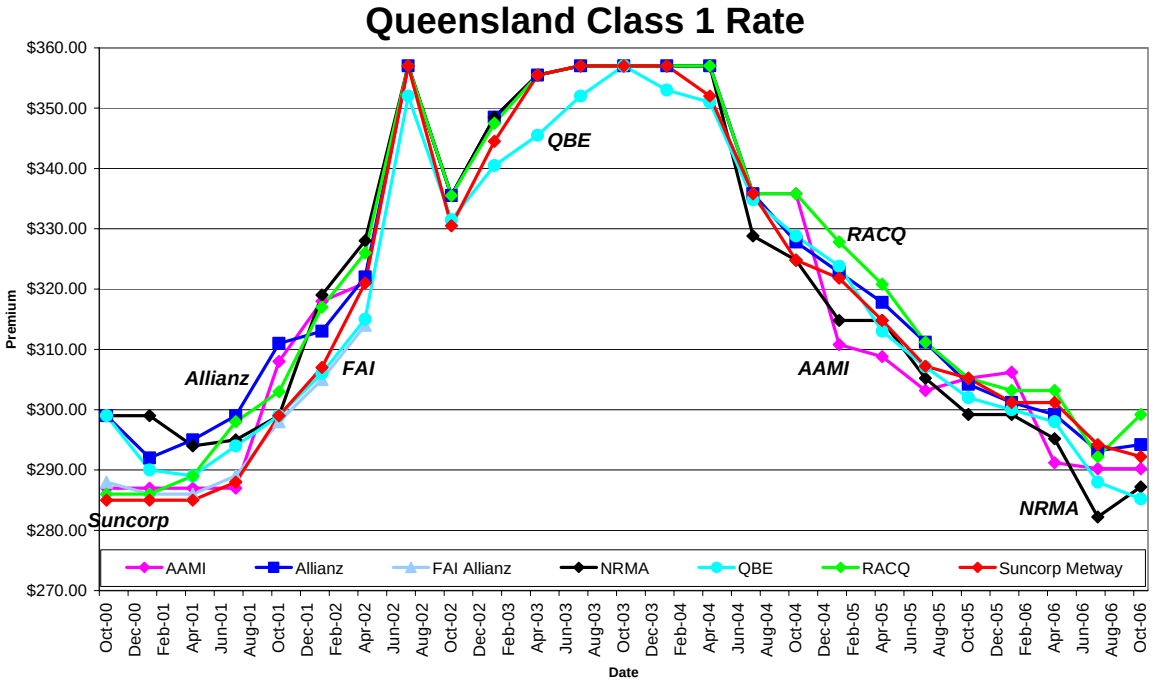
Given the long tail nature of CTP insurance and the uncertainties relating to the outcome of changes to legislation, one would think that there would be a wide range of actuarial opinions about the cost of CTP claims when estimating the fully funded premiums. But this is not apparent when one looks at CTP premiums charged in the market.

Figure 1: NSW CTP Headline Rates Jul-04 to Jan-07



At the beginning of 2006, NSW CTP rates varied by only 2% across all of the insurers. During the course of 2006 an increase in competitive pressures and the introduction of life time care brought about a broadening of rates so that the range varied by 6% across all of the insurers.

Figure 2: QLD CTP Rates Jan-06 to Jan-07



Similarly, at the beginning of 2006, Queensland CTP rates varied by only 2.5% across all of the insurers. Increasing competitive pressures led to all insurers reducing rates during

2006. NRMA and QBE were especially aggressive during this time, and they have broadened the difference in market rates to 8%.

Despite this broadening of rate differences during 2006, the rates being charged are remarkably similar between insurers. Much larger differences can be observed between insurers in the private motor market. There are several reasons for this clustering of prices, the most important of which are:

- Regulatory: The CTP regulator in each state constrains the range of average premiums that may be charged and also the range of individual premium variations from the average. This prevents insurers from charging rates that are too different from one another.
- Transparency: Unlike private motor, the rating structure is simple and is published, available for all to see. Insurers are therefore able to fully understand how their rates sit against each other.
- Data: Industry claims data is available for both NSW and Queensland. This allows actuarial analysis that has greater certainty and credibility. Random differences between insurers' results have less impact upon the insurers' estimates of fully funded premiums.
- Signalling: Consulting actuaries provide regular analysis of industry data, and their analysis is widely distributed. This signals a "normal" set of assumptions to use in pricing. When legislation changes, such as the introduction of life time care in NSW, the regulator may commission an actuarial report on the expected costs of the changes, and release that report to insurers – this sends a strong signal to insurers as to what amount to adjust their premium rates.

9.5 Measuring Competitiveness

The number of players in the market is low which would imply a less competitive market. This was measured above with the concentration in the top 4 players being 86% of the market in NSW and 94% in Queensland.

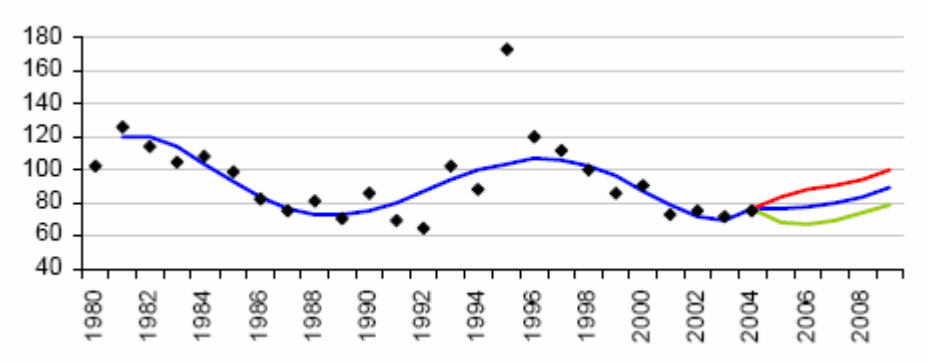
Competitor prices are very close. In NSW over the past three years the average gap between the cheapest and the dearest player on the Class 1 rate has been around $17 or 5% and in Queensland over the past six years the average gap between the cheapest and the dearest player has been $12 or 4%. This would suggest that the market is very price focused. This is confirmed in our survey results that suggest a $3 to $10 difference will lead a customer to leave.

When a market level is set there is competition at that level in terms of small differences in prices. The fact that there is a concentration in the major players begs the question as to whether the market level price could be lower if there were more insurers in the market.

9.6 Historic Cyclical Nature

CTP insurance has its own insurance cycle. The IAAust insurance cycle working party (Chidgey et al) found a regular insurance cycle in Australia CTP and correctly forecast back in 2005 that the CTP market would face increasing competitive pressures over the following years.

Figure 3: CTP Insurance Cycle Seen In Loss Ratios (source: Chidgey et al)



The insurance cycle experienced by CTP has a number of unique drivers:

- anchoring: The relatively small number of actuaries working in CTP pricing tend to follow consensus opinion when setting assumptions and when changing assumptions. They also try to remove "random" fluctuations in results rather than facing the difficult task of explaining each and every change in assumptions caused by differences between actual versus expected results – this can result in some assumptions not being changed quickly, or assumptions suddenly having to change dramatically when the evidence becomes too overwhelming to ignore. For example, the high loss ratio seen for 1995 in the graph above was caused by reserving actuaries suddenly recognising in 1995 the high claims costs that had occurred across a number of previous years.
- bursts of superimposed inflation: Superimposed inflation does not come evenly over time. Changes in interpretation of law and new heads of damages come as discrete changes rather than as gradual changes to the claims environment. These changes appear only occasionally, and start to force loss ratios and premiums up.
- legislative change: When superimposed inflation causes too much pressure on costs, governments respond by changing legislation to limit claims costs. So after a period of upward pressure on costs, the industry sees a downward trend in reported costs, as actuaries gradually allow for the legislative savings in their reserving and pricing assumptions.

In addition, CTP is subject to the same forces that drive the rest of the insurance cycle. After a number of bumper years, Australian insurers in 2007 have surplus capital and a desire to increase their market share across the many lines of business that have been profitable. The excess capital and pressure to increase market share is affecting CTP in much the same way as we are seeing in other lines of business. Furthermore, some insurers are leveraging their direct insurance operations to cross-sell between CTP and private motor insurance, and so the increasing competitive pressures in private motor are affecting competition in the CTP market.

9.7 Anchoring

Question: How many actuaries does it take to change a light bulb?
Answer: How many did it take last year?

Anchoring in actuarial areas is highlighted in the study "Making Actuaries less Human". The above joke is characteristic of many actuarial processes where assumption setting or central estimate determination is not independent from time period to time period.

Actuaries tend to anchor on previous period assumptions. Some processes which encourage anchoring are:

- reconciling results with previous valuation;
- starting with last years valuation model and factors as a basis;
- only changing assumptions gradually as experience emerges; and
- a reluctance by clients, particularly listed corporations, to accept large fluctuations in their results simply because the actuary changed their assumptions.

Competitors in the market also behave in this way. Some of this is symptomatic of the flow through of the "actuarial valuation anchors" which guide the pricing. But the actuaries are not all to blame; product management also look at premium change relative to where they were last filing and relative to what the competitors are or are perceived to be doing. They also anchor to their budget projections due to personal financial incentives around growth in portfolio. Anchoring is not all bad. It helps us map out behaviours and expectations of how we think competitors will react. Anchoring to other market players ensures you don't get a biased mix of risks which will adversely affect profitability.

9.8 Where is the Market going?

To help frame the market in which the CTP game is played a survey was carried out amongst insurers and insurance analysts on their perception of the market and behaviours. The general conclusions were as follows:

There was a belief that the market has got more competitive over recent years and it was expected that there would be a moderate to strong fight for market share. A decrease in premium of the order of 2% to 4% is expected over the next year

In Queensland market prices are reviewed every quarter which is in line with the fixed quarterly premium filings and the inability to change rates in the interim. In NSW, market prices are reviewed with a frequency of between once a week to once a month. This is driven by the ability to file more frequently in NSW.

GIO was viewed as the most competitive in the NSW market. QBE was viewed as the most competitive in the Queensland market.

It was felt a competitor can influence their volume of business quite a bit. The strategy to do this was a mixture of both market and pricing.

It was viewed that the mix of business could only be influenced by a small amount. There was no clear strategy as to what influences the mix best.

Competitors generally always consider market prices. It was felt that generally most customers move for between $3 and $10. Most contributors did not have an elasticity of demand model and did not feel that they needed one

10 Game Theory

10.1 The Development of Game Theory

Game Theory is an economic theory of strategic decision making. It was designed as a decision making tool suited to use in complex situations in which not only are you trying to manipulate your environment to your advantage, but also where it in turn is trying to manipulate you to its advantage too.

Game theory has its roots in varied writings over a long period of time:

- The Talmud (0 to 500AD) – considered how to split the assets from a deceased estate and it came up with a way that varied with the total value of the estate;
- Waldegrave (1713) – considered how to play the card game le Her;
- Cournot (1838) – considered the workings of a duopoly;
- Darwin (1871) – gave a game theoretic explanation of how natural selection will equalise the gender ratio;
- Edgeworth (1881) – proposed a mathematical solution to determine the outcome of trading between individuals;
- The invention of game theory is attributed to John von Neumann and Oskar Morgenstern who were looking for a way to deal with some economic problems. After individually publishing specific solutions for more than twenty years, in 1944 they published the more comprehensive "Theory of Games and Economic Behaviour". They noticed that some economic problems are identical to situations that appear in games of strategy;
- Game theory was soon applied to other real life problems, for example in 1943 game theory was successful applied to a military problem involving where to best place reconnaissance aircraft to monitor a Japanese convoy when the route of the convoy was not known in advance;
- In 1950-1953 Nash (the John Nash depicted in the movie "A Beautiful Mind") developed the theory for the outcome of bargaining, providing a link between cooperative and non-cooperative games;
- In 1952-1953 Shapely provided a general solution (called the "Core") to the allocation of payoffs from forming a coalition; and
- In 1962 Borch published the first known use of game theory in insurance "Application of Game Theory to Some Problems in Automobile Insurance" showing how game theory can be applied to determine insurance premiums.

10.2 Pay-off Grids

The quickest way to understand the idea of game theory is to see it in action in a simple example. Consider the following scenario: two insurers (called Biggy and Newby) are competing for two CTP fleet accounts (called Benedict and Unsure). Benedict has 100 vehicles while Unsure has 70 vehicles. Each insurer has only one account executive available to make the sale – so each insurer must choose which fleet to target. Both fleets are currently insured with Biggy. Newby wants to win some business away from Biggy. If neither account executive targets a fleet, then the fleet will stick with its current insurer, Biggy. If only one account executive targets a particular fleet, then that fleet will insure with the insurer who sent the account executive. If both account executives target Benedict, then that fleet will give 70% of its business to Newby. However if both account

executives target Unsure, then that fleet will give 50% of its business to each insurer. Which fleet should each insurer target?

Game theory has some standard ways of expressing problems such as this as a set of "payoffs" in a grid. In game theory terminology a payoff is the reward or cost resulting from making a particular decision. Each column in the grid represents a choice by one of the players, while each row in the grid represents a choice by the other player. So each cell in the column represents a unique scenario in which both players have made a choice, and the number shown in that cell represents the result of the choice.

We can look at all of the possible vehicle count outcomes in a grid showing the payoff from the perspective of Biggy.

If both insurers target Benedict, then Biggy will keep all of the 70 vehicles in Unsure, but only 30 vehicles from Benedict, giving a total payoff to Biggy of 100. The top left grid cell contains this total payoff amount because it is the cell where both insurers target Benedict.

Table 1: Step one of building the payoff grid for Biggy

		Strategy chosen by Newby Insurance	
		to target Benedict	to target Unsure
Strategy chosen by Biggy	to target Benedict	100	
	to target Unsure		

If both insurers target Unsure, then Biggy will keep all 100 vehicles from Benedict, but only 35 vehicles from Unsure, giving a total payoff to Biggy of 135.

Table 2: Step two of building the payoff grid for Biggy

		Strategy chosen by Newby Insurance	
		to target Benedict	to target Unsure
Strategy chosen by Biggy	to target Benedict	100	
	to target Unsure		135

If Biggy targets Benedict and Newby targets Unsure, then Biggy will keep all 100 vehicles from Benedict, but Newby will win all 70 vehicles from Unsure, giving a total payoff to Biggy of 100.

Table 3: Step three of building the payoff grid for Biggy

		Strategy chosen by Newby Insurance	
		to target Benedict	to target Unsure
Strategy chosen by Biggy	to target Benedict	100	100
	to target Unsure		135

If Biggy targets Unsure and Newby targets Benedict, then Biggy will lose all 100 vehicles from Benedict, but will retain all 70 vehicles from Unsure, giving a total payoff to Biggy of 70.

Table 4: Step four of building the payoff grid for Biggy

		Strategy chosen by Newby Insurance	
		to target Benedict	to target Unsure
Strategy chosen by Biggy	to target Benedict	100	100
	to target Unsure	70	135

10.3 Dominance

It is not immediately clear which decision Biggy should take. The best result for Biggy is if both insurers target Unsure. But Biggy cannot force Newby to go that way. If Biggy targeted Unsure in the hope of achieving this, then Newby could target Benedict and Biggy would be in a worst case scenario, keeping only 70 vehicles.

We can also look at the same outcomes from the perspective of Newby:

Table 5: The payoff grid for Newby

		Strategy chosen by Newby	
		to target Benedict	to target Unsure
Strategy chosen by Biggy	to target Benedict	70	70
	to target Unsure	100	35

The best result for Newby is if Biggy targets Unsure and Newby targets Benedict. But Newby cannot ensure that Biggy will choose to target Unsure. Note however, that if both insurers target Benedict, then Newby is no worse off than if it chose to target Unsure. Newby is always at least as well off and sometimes better off when it chooses to target Benedict over Unsure. In game theory terminology this is called “dominance” i.e. for Newby the strategy of targeting Benedict dominates a strategy of targeting Unsure.

Now that we know that Newby should target Benedict, it is easier to decide the best strategy for Biggy. It too should target Benedict because a payoff of 100 is better than a payoff of 70.

So game theory has shown us that in this sample scenario that the best strategy for both insurers is to target Benedict. This strategy is an equilibrium point because neither party can improve their position via a unilateral action.

This type of scenario is what game theory calls a “zero sum game” because the total payoff doesn’t change, no matter which strategic decisions are made. There are always 200 vehicles, and the decisions only affect the share between the two insurers. A win for one insurer is always a loss for the other insurer.

10.4 Bargaining Power

In the previous example we saw how two insurers brought about a situation in which each one’s strategy was limited to only a single option. Next we consider a situation in which a player’s strategy is not limited to a single option, and what that means about that player’s bargaining power.

Consider a scenario in which a government carries out a review of the maximum profit margin allowed for licensed CTP insurers. It forms a working party to make recommendations. Recommendations are to be determined via a majority vote. The

working party consists of individuals representing those with a vested interest and the number of members allocated to each vested interest group is:

Table 6: Number of Votes Allocated in the Working Party

Consumers	5 votes
Insurers	5 votes
Claimants	2 votes
Regulator	1 vote

How much voting power does each vested interest group hold? Surprisingly, the answer is not the same as the number of votes that each group has available.

There are 13 votes in total, so 7 votes are required to make a recommendation. No single vested interest group has enough votes on its own – only a consensus of more than one vested interest group can put together 7 votes. So the groups must form coalitions in order to pass a recommendation. If consumers team with insurers or claimants, then they will have enough votes to pass a recommendation. Similarly, if insurers team with consumers or claimants, then they will also have enough votes to pass a recommendation. If claimants team with consumers or insurers, then they will have enough votes to pass a recommendation. But if any vested interest group teams with the regulator, then they will still not have enough votes to make a recommendation – in such a case they would still need to have a third group join the coalition. The regulators cannot form a coalition with any other single group that would total enough votes to pass a recommendation. While the regulator could be part of a larger coalition that has at least seven votes, the other members of that larger coalition would already have enough votes between them to pass a recommendation – they would not have any need for the regulator's vote.

So in this scenario, the regulator has no affect upon any voting decision and therefore has no bargaining power!

Despite the number of votes allocated, consumers, insurers and claimants would each have the same amount of bargaining power because each has the power to give another group enough votes to pass that other group's recommendation. The consumer, insurer or claimant groups each have the same power to require a concession from the other in exchange for granting their voting power to that group.

This demonstrates an important result of game theory: bargaining power is determined solely by the power one can exert upon the outcomes of other players.

10.5 Mixed Strategies

Now let's consider another scenario in which neither strategy is dominant. A criminal (not your average claimant) is considering how to make a fraudulent CTP claim and has a choice between faking pain that prevents a return to work, or of overstating pre-injury income. Time constraints prevent the criminal from choosing both actions. If the criminal successfully fakes pain that prevents a return to work, then they will receive a payout of $150,000. If the criminal successfully overstates income, then they will receive a payout of $100,000. However, if the insurer is able to prove fraud, then the criminal does not receive a payout. The insurer has enough resources to investigate all claims for only one type of fraud or the other. When the insurer investigates claims for income levels, the insurer has a 100% success rate with identification of income overstatement. However,

the subjectivity of pain means that the insurer has only a 50% success rate with investigations into fraudulent claims for pain.

Table 7: The payoff grid for fraud

		Strategy chosen by criminal	
		to overstate income	to fake pain
Strategy chosen by insurer	to investigate income	0	$150,000
	to investigate pain	$100,000	$75,000

Unlike our first example, neither strategy dominates. One might be tempted to think that the criminal should choose to fake pain because the payouts average to $112,500, which is higher than the payouts for overstating income. But the moment that the criminal chooses to fake pain as his sole strategy, the insurer can simply choose to investigate pain, and limit the criminal's payout to the much lower amount of $75,000. Averaging the payouts to choose between strategies doesn't work because the opposing player is not acting independently of your strategic choices. If the criminal only chose a particular strategy, then the insurer could always target that for investigation. Similarly, if the insurer always used a particular investigation, then the criminal could always choose a type of fraud that avoid investigation. In such a case, using either strategy allows the other party to choose a strategy that gives them an advantage against you.

However, what if the criminal used the toss of a coin or dice to determine which type of fraud to commit? If the criminal's choice is random, then the insurer will not know which choice the criminal made in any specific instance. So the insurer's payoff for each of its strategic choices will be the weighted average of the payoffs caused by each of the criminal's possible strategic choices. For example:

If the criminal chooses either strategy half of the time, then the insurer's payoffs are:

1. Payoff to investigate income = ½ times $0 + ½ times $150,000 = $75,000
2. Payoff to investigate pain
   = ½ times $100,000 + ½ times $75,000
   = $87,500

In such a case it makes sense for the insurer to always investigate income, as it results in less being paid out to the criminal. So the criminal's payoff from a 50:50 mixed strategy is $75,000.

Similarly, if the criminal decides to overstate income 20% of the time, then the insurer's payoffs are:

1. Payoff to investigate income = 20% times $0 + 80% times $150,000
   = $120,000
2. Payoff to investigate pain
   = 20% times $100,000 + 80% times $75,000
   = $80,000

In such a case it makes sense for the insurer to always investigate pain, as it results in less being paid out to the criminal. So the criminal's payoff from a 20:80 mixed strategy is $80,000.

Note that the second mixed strategy is better than the first strategy we considered. There is an optimal mix of strategies for the criminal that maximises the criminal's average payout. In this scenario there is a closed form solution to the optimal mix of strategies.

We can derive the formula as follows:

Let $p_{claimant}$ be the probability of the fraudulent claimant choosing to overstate income.
The payoff to the insurer of investigating income =
$p_{claimant} * 0 + (1 - p_{claimant}) * 150{,}000$
The payoff to the insurer of investigating pain =
$p_{claimant} * 100{,}000 + (1 - p_{claimant}) * 75{,}000$

In order for the insurer to be indifferent, these two payoffs must be equal.
Therefore:
$p_{claimant} * 0 + (1 - p_{claimant}) * 150{,}000 = p_{claimant} * 100{,}000 + (1 - p_{claimant}) * 75{,}000$

This solves to $p_{claimant} = 3/7$ with an average payoff of $85,714

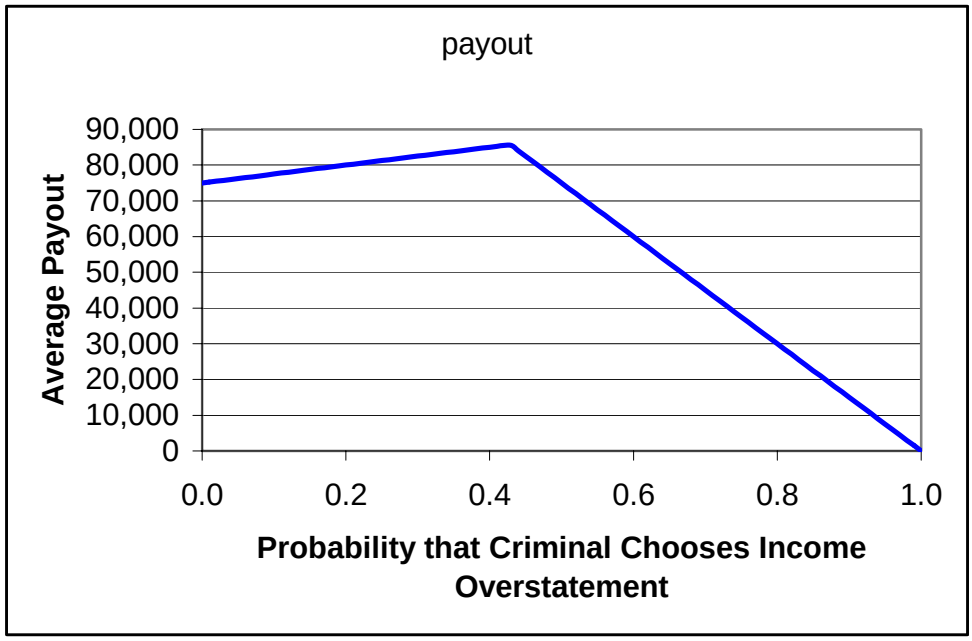
Similarly,
Let $p_{insurer}$ be the probability of the insurer choosing to investigate income.
The payoff to the claimant of overstating income =
$p_{insurer} * 0 + (1 - p_{insurer}) * 100{,}000$
The payoff to the claimant of faking pain =
$p_{insurer} * 150{,}000 + (1 - p_{insurer}) * 75{,}000$

In order for the insurer to be indifferent, these two payoffs must be equal.
Therefore:
$p_{insurer} * 0 + (1 - p_{insurer}) * 100{,}000 = p_{insurer} * 150{,}000 + (1 - p_{insurer}) * 75{,}000$

This solves to $p_{claimant} = 1/7$ with an average payoff of $85,714

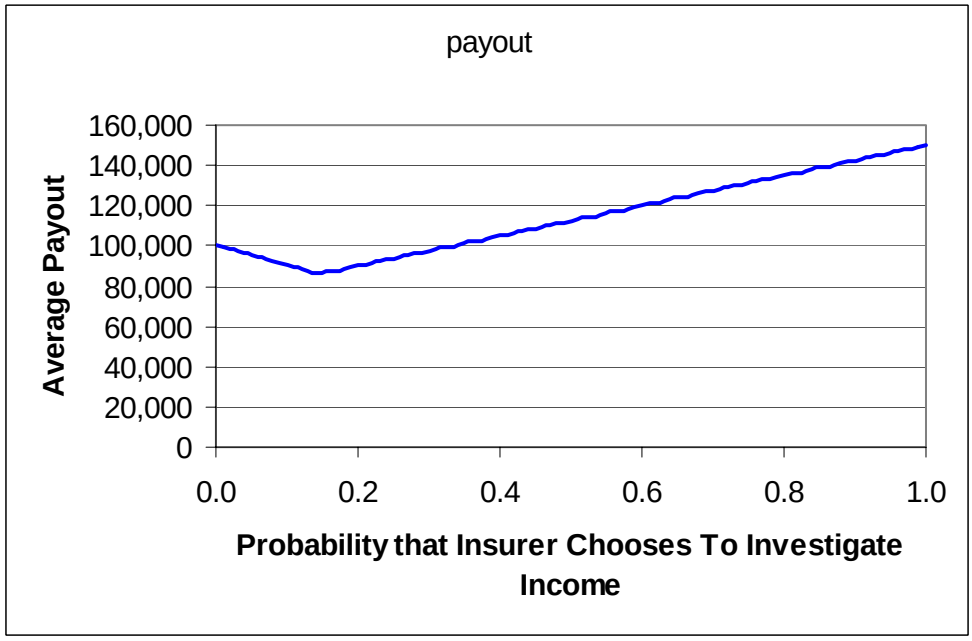
You will get the same results via trial and error, looking at the average payoffs using different probabilities, much like the numbers backing the following two graphs. For more complex payoff grids it is possible that no closed form solution exists.

Table 8: Average fraud payout related to criminal's mix of strategy



If the criminal randomly chooses to overstate income three out of every seven attempts, then the criminal has the same average payout of $85,714 no matter which strategy the insurer chooses. If the criminal uses any other probability to select between strategies, then they will give an advantage to the insurer because then the insurer would be in a situation in which one of their strategies gives an average payout lower than $85,714, and the insurer will therefore choose that strategy. For example, if the criminal chooses either strategy with equal probability, then the insurer would be able to limit the average payout to $75,000 by choosing to only investigate income, and the criminal would therefore be worse off.

Figure 4: Average fraud payout related to the insurer's mix of strategy



The same logic holds for the insurer. It should randomly choose to investigate income overstatement one in every seven times, or it will give an advantage to the criminal. If the

insurer randomly chooses to investigate income one out of every seven attempts, then the criminal has the same average payout of $85,714 no matter which strategy the criminal chooses. If the insurer uses any other probability to select between strategies, then they will give an advantage to the criminal because then the criminal would be in a situation in which one of their strategies gives an average payout greater than $85,714, and they will therefore choose that strategy. For example, if the insurer chooses either strategy with equal probability, then the criminal would be able to increase the average payout to $112,500 by choosing to only fake pain, and the insurer would therefore be worse off.

By choosing the mixed strategy probabilities based upon the payoffs to the opposing player, the player has guaranteed that their average payoff will not drop below a minimum amount – if the opposing player does not also optimise their mixed strategy, then the player may take advantage of that behaviour and receive a greater average payoff.

Mixed strategies have other uses in insurance:

- Deciding whether to check underwriting details provided by the insured
- Deciding whether to take a claim to court
- Deciding how to do internal audits of underwriting and claims practices

10.6 Co-operation

Now let's consider a more complex scenario: An insurer and a claimant are negotiating over a settlement. There are two options for settling the claim:

1. a structured settlement of annual payments costing a total of $100,000
2. a lump sum of $150,000

If the two parties cannot agree on the type of settlement, then the insurer will incur legal costs of $50,000, and the court will award the claimant a lump sum of $120,000 from which they will need to pay $30,000 in legal costs. What strategies should the insurer and claimant take?

For the purposes of this paper we are going to simply look at the dollar cost involved in this scenario, and use that dollar cost when calculating the payoffs. In practice the situation is more complex because the dollars are not directly interchangeable. One would have to consider the time value of money and each party's sensitivity to the timing of cash flows due to factors such as capital requirements and the short term cost to the claimant of making changes to their lifestyle.

When considering this scenario, since this is not a zero sum game (the total payoff varies depending upon the choices made), it is useful to present the payoffs for both parties at once. The lower left corner of the grid cell represents the payoff for the insurer, while the upper right corner of the grid cell represents the payoff for the claimant.

Table 9: Payoff grid for claim negotiation

		Claimant	
		request structured settlement	request lump sum
Insurer	offer structured settlement	-100,000 / 100,000	-170,000 / 90,000
	offer lump sum	-170,000 / 90,000	-150,000 / 150,000

Like our last scenario, neither strategy dominates. Whenever the parties cannot agree on a settlement amount, both parties end up being worse off. It is clearly in the interests of both parties to come to an agreement and avoid legal costs. But sometimes the two parties will have different preferences for the type of settlement depending upon their individual circumstances at the time. The payout grid position in which both the insurer and the claimant agree to settle for a lump sum gives better payouts to each party than the adjoining grid positions. Similarly the payout grid position in which both the insurer and the claimant agree to a structured settlement gives better payouts to each party than the adjoining grid positions. In game theory terminology, these better locations in the grid are called “Nash Equilibria” because neither party can obtain an advantage from that point by taking a unilateral action (in this case because by doing so that party would incur extra legal costs and would therefore be worse off).

In this scenario, the worst case scenario is for both parties to disagree on the settlement amount, so neither party wants that scenario. However, if either party chooses their preferred option, then they risk the possibility that the other party will also choose their preferred option, and that they will be worse off.

As explained in the previous section, game theory provides a solution to this dilemma – a mixed strategy. Neither party should follow a fixed, predictable rule – they each should randomly choose which strategy to play, but with a fixed probability for each strategy. And that fixed probability should not be based upon the payoffs for the player, but instead be based upon the payoffs for the opposing player! If the insurer uses a random number generator to unpredictably offer a structured settlement six times out of every seven, then the claimant has the same average payoff no matter whether they choose to hold out for a lump sum or not. The claimant would have an average payoff of $98,571. Similarly, if the claimant uses a random number generator to unpredictably request a lump sum two times out of every nine, then the insurer has the same average payoff no matter whether they choose to hold out for a structured settlement or not. The insurer would have an average payout of -$154,444. The probabilities to be used are chosen so as to equalise the opposing player’s average payoff for each strategy - to choose a strategy with a probability that does not equalise average payoff would give an advantage to the opposing player.

In this scenario, if we can get both players to co-operate, then there is an even better option than a mixed strategy – if both parties agree an amount between $100,000 and $150,000. Both parties would be better off agreeing to a value in this range because the average legal fees saved are greater than the range of co-operative outcomes.

Once again, game theory provides a means for determining which value to agree upon. In game theory terminology, the “Shapely value” is used for determining the allocation of rewards from co-operating in proportion to the marginal contribution of co-operation from each player. In this case, if the insurer made a unilateral decision to always offer a structured settlement then the claimant would be $51,429 better off and the insurer would

be $4,444 better off. If the claimant made a unilateral decision to always accept a lump sum then the insurer would be $54,444 better off and the claimant would be $1,429 better off. Both of these pairs of amounts total to $55,873, meaning that each party has the same bargaining power, so the benefits of co-operation should be shared equally. The co-operative payout would be $126,508 which is the average of the payouts from the mixed strategy. Note that in this case the co-operative payout slightly favours the claimant because the insurer has greater potential legal costs if it does not co-operate i.e. the claimant has the greater bargaining power because the insurer has more money to lose in legal fees than does the claimant.

10.7 A "Fair" Share of the Benefits of Co-operation

Shapely values should also be considered in pricing decisions in insurance, since insurance comes about by a number of individuals co-operating to spread out their risk. Consider a scenario in which an insurer has three distribution channels, each run entirely independently. The insurer is considering consolidating the central operations of the distribution channels to reduce expenses to ensure more competitive pricing. Channel A writes $100m of CTP with fixed expenses of $12m and variable expenses of $80m. Channel B writes $300m of CTP with fixed expenses of $10m and variable expenses of $250m. Channel C writes $50m of CTP with fixed expenses of $13.5m and variable expenses of $35m. When any two distribution channels are combined, there are savings of 35% of fixed expenses. When all three distribution channels are combined, there are $20m in expense savings. The question arises, how should the expense savings be shared between the distribution channels?

One option that would commonly be used by actuaries is to spread out the fixed expenses in proportion to the premiums, giving each distribution channel the same "fair" share of the new lower total level.

Table 10: The Common Actuarial Approach to Allocating Fixed Expenses If All Three Merge

Distribution Channel	Premium	% Total Premium	Fixed Expenses
A	100	22%	3.4
B	300	67%	10.3
C	50	11%	1.7
Total	450	100%	15.5

But game theory says that this approach is not correct. Distribution channel B is actually worse off after the merger of operations! It had already achieved the economies of scale required to cover its fixed expenses. So the manager for distribution channel B would fight to avoid having his operations merged with the other two distribution channels.

Table 11: The Common Actuarial Approach to Allocating Fixed Expenses if Only A and C Merge

Distribution Channel	Premium	% Total Premium	Fixed Expenses
A	100	67%	11.1
C	50	33%	5.5
Total	150	33%	16.6

On the other hand, if B holds out and only distribution channels A and C are left to merge, and the fixed expenses are allocated in proportion to premiums, then the deal for channel A ends up worse off than before the merger. The proposition is not all that attractive to A – they may save $0.9m in fixed expenses, but they lose their independence. It is quite possible that channel A's manager would follow the lead of channel B, and she would also pull out of the merger of operations.

Using the common actuarial approach of allocating fixed expenses by written premium, distribution channel C would receive an unfair share of the benefits of the expense savings. Channel C does not have the same bargaining power as the other two distribution channels. Channel B, which is already running efficiently, has the most bargaining power because it can offer to share its operational efficiencies with the other two distribution channels. However channel B needs to receive a reward in exchange for sharing its efficiencies, and allocating fixed expenses in proportion to premium does not achieve this.

A fair distribution of the savings in fixed expenses cannot result in higher expenses for any distribution channel.

Game theory calculates the fair distribution of the fixed expenses using "Shapely values". These values allow for the bargaining power that each player has when it co-operates with other players. The Shapely value considers each possible permutation in the order in which players joined a coalition. For example the order of the distribution channels joining together to co-operate could be A then B then C, or equally it could have been C then A then B. It allocates the marginal benefits of each member joining to the last member that joined. Then the costs for that member are averaged over all of the possible orders of joining up.

Table 12: Step 1 in Calculating the Shapely Value - The Fixed Expenses Incurred by Each Coalition

Coalition	Expenses
A	12.0
B	10.0
C	13.5
AB	14.3
AC	16.6
BC	15.3
ABC	15.5

The first step in calculating the Shapely values is to calculate the total fixed expenses that each co-operative coalition would incur.

The second step is to consider the difference in total expenses for each possible coalition of distribution channels. One needs to consider the order in which the coalition formed. For a coalition of three parties there are 6 possible permutations to how that coalition formed. Those six permutations are listed in the table below. For example if the coalition formed in the order of C then A then B, we have labelled this formation as CAB, and we have labelled the two steps of formation as C->CA and CA->CAB. Each step of the formation has been colour coded, as this helps us to follow what happens in later steps. Green indicates the first channel joining the coalition. Yellow indicates the second channel joining. Finally, red indicates the last channel joining the coalition.

Table 13: Step 2 in Calculating the Shapely Value – Pathways Towards Shared Co-Operation

Total Fixed Expenses

1st Channel Joins		2nd Channel Joins		3rd Channel Joins	
A	12.0	A->AB	14.3	AB->ABC	15.5
A	12.0	A->AC	16.6	AC->ACB	15.5
B	10.0	B->BA	14.3	BA->BAC	15.5
B	10.0	B->BC	15.3	BC->BCA	15.5
C	13.5	C->CA	16.6	CA->CAB	15.5
C	13.5	C->CB	15.3	CB->CBA	15.5

Marginal Fixed Expenses

1st Channel Joins		2nd Channel Joins		3rd Channel Joins	
A	12.0	A->AB	2.3	AB->ABC	1.2
A	12.0	A->AC	4.6	AC->ACB	-1.1
B	10.0	B->BA	4.3	BA->BAC	1.2
B	10.0	B->BC	5.3	BC->BCA	0.2
C	13.5	C->CA	3.1	CA->CAB	-1.1
C	13.5	C->CB	1.8	CB->CBA	0.2

When the first distribution channel joins, the fixed expenses used are the fixed expenses for that distribution channel e.g. in the coalition CAB the fixed expenses allocated to C are $13.5m because none of the benefits of merging are available.

When the second and third distribution channels join, the fixed expenses attributed to that distribution channel are lower because they receive ALL of the benefits of the merger i.e. in the coalition CAB the fixed expenses allocated to A are $3.1m because the fixed expenses for a merged operation of A and C are $16.6m compared to the fixed expenses for C of $13.5m.

Table 14: Allocation of Fixed Expenses Using Shapely Values

Coalition Order	A	B	C
ABC	12.0	2.3	1.2
ACB	12.0	-1.1	4.6
BAC	4.3	10.0	1.2
BCA	0.2	10.0	5.3
CAB	3.1	-1.1	13.5
CBA	0.2	1.8	13.5
Average	5.3	3.7	6.5

Note that the Shapely values have some useful characteristics:

- total to the correct amount of $15.5m for the merged entity
- all of the distribution channels receive a benefit from the co-operation
- those with the most to share are rewarded the most for doing so

Table 15: Proportional Share of Fixed Expenses versus Shapely Value Share

Distribution Channel	Premium	Allocated by Premium	Shapely Value
A	100	3.4	5.3
B	300	10.3	3.7
C	50	1.7	6.5
Total	450	15.5	15.5

Note that the Shapely value gives considerably lower fixed expenses to B and considerably higher fixed expenses to C. That is because it allocates in order to reward the act of co-operation rather than simply allocating to those who would benefit the most.

The same logic can be applied to other important allocation decisions in insurance:

- Allocation of profit margins between policies
- Allocation of capital between portfolios
- Allocation of diversification benefits to risk margins
- Allocation of fixed expenses
- Allocation of reinsurance premiums within an insurer
- Whether to give special treatment to large intermediaries

In these types of decisions the current generally accepted market practice in the Australian insurance industry is sometimes inconsistent with the optimal allocations determined by game theory.

10.8 Applying Game Theory to CTP Pricing

In this section we present a couple of hypothetical scenarios to demonstrate the use of game theory to support CTP pricing decisions. The payoff grids show the insurance profit after one period of time, and then we apply game theory to discuss the strategic implications and the choices faced by the insurer.

Firstly we consider a scenario in which the market has been in a stable and profitable state for some time. But then your competitor drops rates, whether to get more business or because they incorrectly conclude that claims costs are lower than previously believed. Policyholders start to switch to that insurer.

The second scenario is one of a soft market. It demonstrates how insurers can become trapped in a situation in which rates are inadequate, but also where the insurer that chooses to increase rates to an adequate premium is worse off!

A detailed description of the workings of these scenarios can be found in section Appendix B. We designed scenarios that allowed for price elasticity, fixed expenses and changes in mix of business. The scenario assumptions were chosen to maximise the clarity of the point being made, but we are confident that more realistically calibrated assumption would lead to the same type of conclusions.

10.8.1 Scenario 1: Your Competitor Leads Prices Down

Hypothetical Scenario: The market has been charging the same sound technical premium rate for the past year and your actuarial reports do not indicate any need to change rates.

Your main competitor has just dropped their CTP headline rate by $10. Within a month you see customers switching to your competitor. After one quarter you measure that your written premiums have dropped by 50%. The CTP manager is phoning you daily because he isn't meeting budget and he wants to fix things. The CEO is starting to pay personal attention to the situation. What pricing action do you take?

Table 16: Payoff Grid for Sound Technical Premiums at Time 0 (Before Either Insurer Changes Rates)

		Insurer B		
		Drop Premium by $10	No Change	Increase Premium by $10
Insurer A	Drop Premium by $10	16,844 15,297	9,803 23,717	6,552 27,204
	No Change	23,116 10,501	19,600 17,800	11,181 27,597
	Increase Premium by $10	25,714 8,530	26,899 11,978	22,356 20,303

Neither insurer has a dominant strategy available to them. However, for both insurers the strategy to increase premium by $10 is dominated because it will always produce lower payoffs than the other two pricing strategies. So neither insurer should increase rates.

Once we remove the option of a competitor increasing rates, we end up with a simplified payoff grid which only considers holding or dropping premiums. In that simpler payoff grid the option to drop premium is dominant for both insurers i.e. even though both insurers are worse off when they both drop premiums, neither insurer can afford to hold premiums because if they do so, then their competitor will take advantage of them.

Sustaining technically sound premiums under these conditions requires co-operation between the two insurers. A strategy of increasing premium beyond the current technical rates would only benefit either of the insurers if both insurers simultaneously increased their premiums – this too would require co-operation between the insurers. Explicit and deliberate co-operation between insurers is illegal under the Trade Practices Act, so that is clearly not an option. Implicit co-operation may however exist through signalling such as:

- building up a reputation for retaliation
- informing the market of the results of technical analysis
- regulatory activities (e.g. if the regulator states what premium levels it expects to see in rate filings)

These sorts of actions can result in an uneasy truce in which each insurer holds the current rates, but none can be trusted to maintain the unwritten truce for long.

On the other hand, each insurer could be tempted to drop premium rates as there is a chance to improve results by getting a jump. However, if the insurer’s decision to drop premiums is known in advance, then the competitor is forced to also drop rates, and both insurers end up worse off. Neither insurer can trust the other insurer to keep the uneasy truce i.e. neither insurer can be trusted to keep charging sound technical premiums.

So it is not surprising that one of the insurers subsequently chooses to drop their rates. If this happens, then your next strategy is to follow them down or to build up a reputation for retaliation by further undercutting their rate reduction.

10.8.2 Scenario 2: A Soft Market

Hypothetical Scenario: The CTP market has settled for a few years with everyone charging much the same rates. The problem is that the market price is only producing a loss. The Approved Actuary has written a whole chapter of the FCR dedicated to the inadequate profitability of CTP, and that has got the Board all worked up. The Chairman takes the issue to the CEO, who takes it to the general manager, who in turn is rather blunt with you. You are asked to front the Board with a solution. What do you tell the Board?

Table 17: Payoff Grid for Soft Market, Time 0

		Insurer B		
		Drop Premium by $10	No Change	Increase Premium by $40
Insurer A	Drop Premium by $10	-22,796 -22,523	-25,119 -18,824	-26,540 -16,558
	No Change	-20,235 -23,609	-20,000 -20,000	-25,860 -11,980
	Increase Premium by $40	-18,221 -24,137	-13,890 -23,230	-8,814 -9,907

Once again, there is no dominant strategy for either insurer. Therefore, despite the inadequacy of premiums, it isn't in either insurer's short term interest to increase premiums. Of course, in the long term it is in their interests to increase premiums.

Since there is no dominant strategy, the optimal behaviour is a mixed strategy – this means that in this scenario if you follow a predictable strategy at any point of time then your competitor can take advantage of your choice, and that in turn will be to your disadvantage. But each insurer will be hoping that their competitor leads the market up first. If this were to occur, then the insurer that follows the rates up would get the combined benefit of both increased market share and gradually increasing premiums. Both insurers are likely to play "chicken" and hope that the other insurer goes first due to internal political pressure or dwindling capital resources.

If insurers could co-operate, then they would definitely increase rates simultaneously as both insurers would benefit the most from doing so. However, the Trade Practices Act prohibits most forms of deliberate co-operation between the insurers. Co-operative action is more likely to occur implicitly via:

- informing the market of the results of technical analysis of market-wide losses
- regulatory activities (e.g. if the regulator states that rate increases are required in the next rate filings)

11 Practical Questions and strategies

11.1 Gaining Market share

There are three key strategies to gain market share in CTP:

1. pricing
2. advertising
3. cross-selling

The problem with a strategy of growth via competitive pricing is that in order for the strategy to be successful it requires your competitors to co-operate with you by leaving their premiums unchanged. The scenarios that we presented in the previous section show that no rational competitor is going to sit still while you steal their market share. Furthermore, the insurer is hampered in what prices they can charge. The regulator typically requires the insurer to file a sound premium with a reasonable profit margin. Then there is limited ability to move prices on individual risk segments. This can mean that lower premiums change the mix of business, attracting the poorer quality risks (e.g. young drivers). This in turn could prompt the regulator to ask the insurer to increase their rates in response to their increasing loss ratios.

Advertising gives more flexibility. For example, an insurer can target market via advertising. However it suffers from the same key weakness as competitive pricing - in order for the strategy to be successful it requires your competitors to co-operate with you by not increasing their advertising. Furthermore, advertising is expensive, and is not guaranteed effective (one just has to look at IAG's reducing market share during 2006-07 and concurrent advertising blitz to see that advertising won't always increase market share). The effectiveness of advertising is related to the strength of the brand name of the insurer. Anecdotal evidence suggests that advertising CTP insurance will not work unless the insurer also has low premiums.

The direct insurers have increasingly turned to cross-selling in an attempt to increase their CTP market share. They offer discounts on their private motor premiums if the policyholder also takes out CTP insurance. This strategy has some strong advantages:

- a competitor cannot simply match this offer, especially if they don't have a strong direct insurance distribution channel of their own;
- private motor insurance is currently very profitable, and cross-selling may also increase the market share of private motor;
- it works within the constraints placed upon CTP premiums by the regulator; and
- it is a form of target marketing

Game theory would favour a cross-selling strategy for increasing market share because it leverages bargaining power brought about by unique features of an insurer.

11.2 Optimising Pricing – What is the Best Price to Charge?

The best price to charge is determined by the differing circumstances of each insurer, but we can offer the following advice:

1. Always begin by doing your actuarial analysis. If you don't know what your policies cost (claims plus expense drivers), then you are not in a position to determine the optimum pricing strategy.
2. Understand your competitors: their target markets, their financial drivers, their resources, their likely actions and reactions. Do not set prices that assume that your competitors will do nothing in response.
3. In CTP, market positioning matters much more than actuarial analysis of claims. Keep your price differences to competitors inside the trigger points at which policyholders switch insurers in order to avoid churning your book.
4. Avoid triggering a tit-for-tat response from a competitor. It will just result in a softer market. Instead, choose strategies based upon your individual strengths that your competitor cannot match.
5. Remember that an actuarially sound premium can be the wrong premium to charge. Choose the premium that maximises your business aims (profit, growth etc)

11.3 What Should I Do if a Competitor Sets Prices Well Below the Rest of the Market?

If you are lucky, then the competitor will not pick up much market share. But if they are aggressive enough, then they are likely to gain a material amount of market share because CTP is a commodity product with transparent market prices. If they are a smaller insurer, then they may easily be more profitable charging a lower premium.

If the competitor is picking up a poor mix of business, then it may be worthwhile to let them have it. They will quickly hit a point at which the marginal contribution to fixed costs is swamped by the increasing marginal cost of claims.

If the competitor starts to steal too much market share from you, then you must react. You need a critical mass of business to cover your fixed costs, and so there are times when you are better off with a lower premium than a higher premium. If you hold a very large market share to begin with, then you will be able to hold out longer because you are well above the trigger point for covering fixed costs.

11.4 What Should I Do if I Inadvertently Set Prices Well Above the Rest of the Market?

Refile. Quickly.

11.5 Is It OK To Set Rates That Average Less Than a Sound Premium in the Short Term? Should I Allow For This in My NSW Rate Filing?

The scenario we presented in section 10.8.2 shows that there are indeed cases when an insurer should stick with premiums that are less than a sound premium. In a soft market, charging a "sound" premium can leave you with a market share that is too small to be profitable.

Game theory shows that in the cases where you are trapped in a soft market, you need to encourage co-operative behaviour. Note that we are not suggesting that you break the Trade Practices Act and incur the wrath of the ACCC. In a soft market situation, we recommend that you:

- aim to file premiums slightly above your competitor, keeping within the range of premiums that does not incur further price wars and does not lose you a material amount of market share;
- lobby the regulator to require higher premiums;
- publish the results of technical analyses proving that premiums are inadequate; and
- lobby the government to reduce benefits.

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13 Appendix A - Market Practice Guidelines

MAA Market Practice Guidelines

Commencement date: 1 August 2006

These Market Practice Guidelines are issued under s171 of the *Motor Accidents Compensation Act 1999.* They are applicable to Licensed CTP insurers.
All MAA Market Practice Guidelines previously issued by the Motor Accidents Authority are revoked. Such revocation is effective on and from the Commencement Date.

The objects of these Market Practice Guidelines are:

- To ensure CTP insurance is available to all NSW motorists who require it;

- To set a standard for insurers in relation to business practices for the issuing of CTP policies;

- To ensure that all NSW motorists have equal access to CTP insurance. In particular, the MAA Premiums Determination Guidelines issued under s24 of the *Motor Accidents Compensation Act 1999* establish partial community rating for CTP insurance and one of the objects of these Market Practice Guidelines is to prevent insurers from discriminating against motorists they regard as high risk in the issuing of CTP policies (except for pricing differentiation permitted under the MAA Premiums Determination Guidelines).

1) Insurers and their intermediaries must not refuse to provide a CTP quote or a CTP policy for any motor vehicle required to be insured under the *Motor Accidents Compensation Act 1999.* The only exceptions to this are;

(i) Insurers and their intermediaries must refuse to provide a CTP policy to a customer where the customer refuses to pay part or all of the Medical Care and Injury Services Levies.

(ii) Insurers and their intermediaries may refuse to provide a CTP policy to a customer where the customer refuses to pay part or all of the CTP premium or GST.

For the purposes of these Guidelines intermediaries include Brokers, Insurer's Agents and sub-Agents.

2) Insurers and their intermediaries are required to act with promptness and efficiency in relation to the issuing of CTP policies. This includes, but is not limited to:

a) Intermediaries and insurers' staff are to receive clear instructions regarding the issue of policies.

b) If a customer requires a CTP quote to be posted, it must be posted within seven business days.

c) New Business Green Slips or Policy receipts (regardless of the way they are issued) must be mailed or given to the customer within seven business days from the date of payment.

d) Insurers and their intermediaries are to categorize vehicles correctly and charge the correct filed premium for that category.

e) All Policyholders, irrespective of vehicle class, owner/driver age, vehicle age or geographical area, who are due to receive a renewal notice are to be sent an offer of renewal four to six weeks in advance of the renewal date. Delaying sending a notice is not condoned unless there is prior approval from the MAA. Not sending a notice at all is not acceptable.

3) Insurers and their intermediaries must not discriminate in relation to the issuing of a Green Slip policy (except pricing differentiation permitted under the MAA Premiums Determination Guidelines) and are required to ensure that the method of issuing a Green Slip policy is similar for all individual proposers. Issuing a policy includes the:

- methods of providing quotes
- policy delivery
- policy renewals
- payment of premiums

This includes, but is not limited to:

a) Insurers and their intermediaries cannot deter potential customers (including young owner/drivers) by telling them that other insurers offer cheaper premiums. Insurers and their intermediaries may not offer the phone numbers of other insurers to deter customers (including young owner/drivers).
Explanatory note: the above is intended to deter any possible risk avoidance by Insurers. It is not intended to interfere with the business relationships between Brokers/Insurance Agents and their clients.

b) If quotes and policies are offered by telephone, they are to be provided and posted out with equal ease and detail, irrespective of vehicle class, owner/driver age, vehicle age or geographical area.

c) Interactive Voice Response (IVR) and/or the Internet are not to be used as a deterrent or screening device for high risk owner/drivers irrespective of vehicle class, owner/driver age, vehicle age or geographical area.
Explanatory note: Due to the complex and extensive rating structures of Insurers it may not be reasonable to record (IVR, voice mail and other telephone technology) or publish (internet) all premium rates for each vehicle classification and geographical area. If an Insurer elects to use IVR or Internet to advertise the common classes, all premium rates within the advertised class must be recorded or published irrespective of owner/driver age, vehicle age or geographical area.

d) Electronically generated quotes and paper rate charts which are issued to branches or intermediaries will include all premiums for all Class 1, 3C, 10A, 10B and 10C vehicles irrespective of owner/driver age, vehicle type or age or geographical area. Exceptions include rates for Fleets and Groups affiliated with an insurer.

e) Telephone calls are not to be prioritized by any means after they have been answered.

f) Incoming telephone calls are not to be prioritized by the telephone prefix of the caller.

g) An insurer or their intermediary will not require a customer to visit a Branch or Head Office to obtain a CTP policy where this is not the normal method of distribution [irrespective of any factor including vehicle class, owner/driver age, vehicle age or geographical area].

h) An insurer or their intermediary may not quote the recovery of an excess under Sections 17 and 21 as a means of deterring young drivers or unwanted vehicle classes. Circumstances under which an insurer or their intermediary quotes an excess must be declared and pursued in the appropriate circumstances.
Explanatory note: An Insurer or their intermediary cannot use the quoting of an excess to avoid high risk categories. If an insurer or their intermediary declares an excess there must be a real intention to pursue the recovery. There will be some circumstances where pursuit of the recovery is not reasonable, for example, where it is not commercially viable or where it would be morally or socially inappropriate to do so.

4) An offer of a renewal of a CTP policy must include:

i) text that will clearly explain to the customer the reasons for any changes in the prices of the CTP premium. This explanation must describe either industry pricing factors by including the following text: “A number of factors are used to determine the price of your Green Slip. They include the location where the vehicle is normally garaged (zones set by the Motor Accidents Authority), the vehicle category (type/usage). Insurers may also apply other factors such as the age of the vehicle, age of driver(s)/owner(s) and any motor insurance history. If any of these factors change then your premium may change as a result”,

or,

the insurer’s own pricing factors by including text which explains the factors, which the insurer could use to determine the renewal premium offered. These factors must include location where the vehicle is normally garaged, vehicle type and usage, Input Tax Credit entitlement and other rating factors used by the insurer that significantly impact the premium offered.

ii) the following text (recommended by the Australian Taxation Office): “Your Green slip premium will vary according to the vehicle owner/operator’s entitlement to claim an Input Tax Credit on this premium. The premium offered to you is calculated on the basis of the entitlement shown on the Green Slip.”

The text in parts (i) and (ii) must be in the form of a standard up to date leaflet, or in the renewal covering letter, or on the customer portion of the Green Slip itself.

iii) text which provides the insurer contact phone number for Green Slip queries or corrections by including in the renewal covering letter or on the customer portion of the Green Slip words to the effect;
“If any of the information on your Green Slip is incorrect it may alter the premium. To update your specific details before you purchase this Green Slip or if you have any queries please contact us on <<insert phone no>>.”

iv) include with the offer of renewal any information provided by the MAA concerning premium trend data and explanations of the major cost drivers of CTP premiums, as agreed between the MAA and insurers from time to time.

5) a) The insurer must keep a record of complaints in a Complaints Register regarding the issuing of CTP policies.

b) The insurer must make the Complaints Register available for inspection upon request by the MAA.

6) These Guidelines apply to direct distribution and distribution through intermediaries of Green Slips and to verbal, written and electronic services.

7) The MAA may permit an insurer to act in contravention of these Market Practice Guidelines in specified circumstances, where the MAA regards this is reasonable.

14 Appendix B - Some Examples

We have developed some examples of how insurers compete against each other under different circumstances, and effects that different courses of action can have.

We start with two insurers, A and B, who have roughly equal shares of a CTP market which has two types of risks – Best and Worst. The initial position is that all prices area adequate for each risk, and Insurer A has a higher proportion of Best risks than B.

For simplicity, there is no reinsurance. Expenses are partially fixed and partially variable. Capital requirements are 50% of GWP. All policies are annual and evenly spread throughout the year.

Starting Position

Two insurers		A			B		
2 categories of policyholders		Policy Count	Price	E(Claims)	Policy Count	Price	E(Claims)
Best		800	$320	$224	600	$320	$224
Worst		200	$500	$350	400	$500	$350
Total GWP / GIC		1,000	$356,000	$249,200	1,000	$392,000	$274,400
Loss Ratio				70.0%			70.0%
Expenses	Fixed		15%	$53,400		15%	$58,800
	Variable		10%	$35,600		10%	$39,200
Profit				$17,800			$19,600
Capital			50%	$178,000		50%	$196,000
ROE				10%			10%

Insurer B decides to reduce their price on Best risks by $10 per policy. The price for Worst risks is unaffected. After one quarter the position is this:

After 1 quarter

Two insurers		A			B		
2 categories of policyholders		Policy Count	Price	E(Claims)	Policy Count	Price	E(Claims)
Best	Not yet reached renewal	600	$320	$224	450	$320	$224
	Renewed	100	$320	$224	150	$310	$224
	New business				100	$310	$224
Worst		200	$500	$350	400	$500	$350
Total GWP / GIC		900	$324,000	$226,800	1,100	$421,500	$296,800
Loss Ratio				70.0%			70.4%
Expenses	Fixed			$53,400			$58,800
	Variable		10%	$32,400		10%	$42,150
Profit				$11,400			$23,750
Capital				$162,000			$210,750
ROE				7%			11%

The elasticity of demand is such that 50% of risks will move for a lower price. Ultimately the position will be as follows.

Ultimate

Two insurers		A			B		
2 categories of policyholders		Policy Count	Price	E(Claims)	Policy Count	Price	E(Claims)
Best	Not yet reached renewal	-	$320	$224	-	$320	$224
	Renewed	400	$320	$224	600	$310	$224
	New business	-			400	$310	$224
Worst		200	$500	$350	400	$500	$350
Total GWP / GIC			$228,000	$159,600		$510,000	$364,000
Loss Ratio				70.0%			71.4%
Expenses	Fixed			$53,400			$58,800
	Variable		10%	$22,800		10%	$51,000
Profit				-$7,800			$36,200
Capital				$114,000			$255,000
ROE				-7%			14%

Insurer B has benefited enormously from this strategy as the increased business, while at less than the technical rate, has helped to spread their fixed expenses over a wider base. The effect is that their ROE has risen, and Insurer A has shrunk to the point that they are now uneconomical.

Lets look at an alternative plan, in which Insurer B leads the price cutting by cutting prices in the first quarter, but Insurer A undercuts them by $10 in the second quarter. The ultimate position is now:

Ultimate

Two insurers		A			B		
2 categories of policyholders		Policy Count	Price	E(Claims)	Policy Count	Price	E(Claims)
Best	Not yet reached renewal	-	$320	$224	-	$320	$224
	Renewed at new price	600	$300	$224			
	New business	700	$300	224	-	$310	$224
Worst		200	$500	$350	400	$500	$350
Total GWP / GIC			$490,000	$361,200		$200,000	$140,000
Loss Ratio				73.7%			70.0%
Expenses	Fixed			$53,400			$58,800
	Variable		10%	$49,000		10%	$20,000
Profit				$26,400			-$18,800
Capital				$245,000			$100,000
ROE				11%			-19%

Therefore even though they followed Insurer B down the rate cutting path, Insurer A has ended up better off than Insurer B, and with a higher ROE than they started.

If we add some features of the current NSW CTP structure, what effect does this have? In this scenario, insurers are required to move the prices for both Best and Worst risks in unison. Also, the elasticity of demand varies between Best and Worst risks – Best risks are less likely to move than Worst risks for a given price differential, but both groups increase their likelihood of changing insurer the larger the price differential on offer.

Ultimate

Two insurers		A			B		
2 categories of policyholders							
		Policy Count	Price	E(Claims)	Policy Count	Price	E(Claims)
Best	Not yet reached renewal	-	$320	$224	-	$320	$224
	Renewed	600	$300	$224	-	$310	$224
	New business	700	$300	$224	-	$310	$224
Worst	Not yet reached renewal	-	$500	$350	-	$500	$350
	Renewed	150	$469	$350	-	$484	$350
	New business	450	$469	$350	-	$484	$350
Total GWP / GIC			$671,400	$501,200		$0	$0
Loss Ratio				74.6%			
Expenses	Fixed			$53,400			$58,800
	Variable		10%	$67,140		10%	$0
Profit				$49,660			-$58,800
Capital				$335,700			$0
ROE				15%			

Therefore, even with a good deal of realism, in a two move game (one price reduction plus one response) the winner is the insurer with the lowest price ultimately, as profitability is influenced to a large extent by spreading fixed costs over as large a base as possible.

Consider the opposite scenario, where instead of starting at a profitable equilibrium, the insurers start at an unprofitable equilibrium.

Starting Position

Two insurers		A			B		
2 categories of policyholders							
		Policy Count	Price	E(Claims)	Policy Count	Price	E(Claims)
Best		800	$280	$224	600	$280	$224
Worst		200	$450	$350	400	$450	$350
Total GWP / GIC			$314,000	$249,200		$348,000	$274,400
Loss Ratio				79.4%			78.9%
Expenses	Fixed		15%	$53,400		15%	$58,800
	Variable		10%	$31,400		10%	$34,800
Profit				-$20,000			-$20,000
Capital			50%	$157,000		50%	$174,000
ROE				-13%			-11%

Insurer A reaches the decision that their prices must return to the correct technical levels. They decide to try this in one price movement. The result after one quarter is as follows:

After 1 quarter

Two insurers		A			B		
2 categories of policyholders		Policy Count	Price	E(Claims)	Policy Count	Price	E(Claims)
Best	Not yet reached renewal	600	$280	$224	450	$280	$224
	Renewed	80	$320	$224	150	$280	$224
	New business	-	$320	$224	120	$280	$224
Worst	Not yet reached renewal	150	$450	$350	300	$450	$350
	Renewed	-	$514	$350	100	$450	$350
	New business	-	$514	$350	50	$450	$350
Total GWP / GIC			$261,100	$204,820		$404,100	$318,780
Loss Ratio				78.4%			78.9%
Expenses	Fixed			$53,400			$58,800
	Variable		10%	$26,110		10%	$40,410
Profit				-$23,230			-$13,890
Capital				$130,550			$202,050
ROE				-18%			-7%

Things have got much worse for Insurer A as a large proportion of their policyholders have been put off by the rate increase and have changed insurers. However, Insurer B is also suffering so they take advantage of Insurer A's price movement and match their prices, also bringing themselves up to the correct technical level. This results in the following ultimate position.

Ultimate

Two insurers		A			B		
2 categories of policyholders		Policy Count	Price	E(Claims)	Policy Count	Price	E(Claims)
Best	Not yet reached renewal	-		$224	-		$224
	Renewed at old price	-		$224	-		$224
	Renewed at new price	680	$320	$224	600	$320	$224
	New business	-		$224	60	$320	$224
Worst	Not yet reached renewal	-		$350	-		$350
	Renewed at old price	-		$350	-		$350
	Renewed at new price	150	$500	$350	400	$500	$350
	New business	-		$350	35	$500	$350
Total GWP / GIC			$292,600	$204,820		$428,700	$300,090
Loss Ratio				70.0%			70.0%
Expenses	Fixed			$53,400			$58,800
	Variable		10%	$29,260		10%	$42,870
Profit				$5,120			$26,940
Capital				$146,300			$214,350
ROE				3%			13%

The lesson from this is that when both insurers are in an unprofitable equilibrium, the first to move will probably lose the game.

An alternative strategy, if the Insurer understands its customers well enough, is to increase prices in a series of increments, each one small enough that renewing policyholders will be insensitive to it. No new business will be acquired but at least the

existing business is being retained. However, this may mean an extended period of time of inadequate profitability which may be unacceptable to shareholders.