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A Business Model for Evaluation of the PMI Market

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Overview

The Paper

This paper contains the results of our investigations into various aspects of the UK PMI market, using a business model developed by this sub-group for last year's conference. The paper describes the changes that have been applied to last year's model, introduces the scenarios considered, and then discusses the investigations made. In addition, the appendices contain the definition of the model, so that the user can follow some of the logic that we have used in developing and applying it.

The Model

It is hoped that an electronic copy of the model will be made available in the near future. This will allow the interested reader to review our work in more detail, and also, hopefully, to develop their own ideas. Please contact any of the authors for more information.

Presentation at the Conference

At the Conference itself, we shall present in the plenary sessions some more general results that we hope will be of interest to a wider audience. There will also be some time in the Workshop to present a "live" demonstration of the model. Attendees are invited to consider in advance ways that they would like to see the model applied, perhaps to consider a scenario that we have omitted to address so far.

Contents

1: General Description and Purpose of the Model

There were two primary intentions behind the development of the model. The first was to provide a framework within which different strategies could be tested quantitatively. The second was to provide some insight into how the key dependencies interact, hopefully to allow the user a head start in their own investigations. We believe, therefore, that the model is just one of many possible approaches to considering this market, and we welcome the reader's input and criticism.

The model is intended as a tool to be used. However, many of the assumptions and formulae built into the model represent the opinions of the members of the sub-group, and should be considered carefully by the user. It is this consideration that we hope will be most valuable. Indeed the way that we hope that the model can "add business value" is by encouraging discussion of the key issues involved in running a PMI portfolio. Certainly, before using the model to test any of their own scenarios, we would stress the importance to the user of satisfying oneself that our assumptions and opinions are reasonable.

The model is built as a workbook using Microsoft Excel. It comprises several worksheets, and these are grouped into Input, Calculation, and Output sections. The main inputs are parameters that define the market in which our hypothetical player is operating, as well as the characteristics of the player itself. The main outputs are projections of key performance indicators including revenue accounts and balance sheet positions, which allow a financial evaluation of different strategies.

2: BENCH-MARKING AND VALIDATION

Before we set about altering the parameters (and sometimes the formulae) within the model, to test different scenarios and strategies, we needed to be sure that we had a robust model structure with a parameter set that produced satisfactory results. Once we had produced this "Base" model, we used it as the bench-mark for the models used to test each scenario.

Where model parameters could be based on observable data, we applied a combination of publicly-available information and our own experience. The combined experience of the group spans well over 50% of the UK PMI market. However, much of this information and experience has been seasoned with our own opinions and assumptions, so we leave it to the users of the model to satisfy themselves that the starting point is reasonable.

The most interesting feature of the bench-marking work was the pricing approach that had to be taken to achieve any hope of a profit. In fact, the only way we could find to do this was to over-price quite heavily (we used a factor of 1.3). The reasoning for this stems from the advantages that the market (or an individual established player) has over a new entrant: principally a marginal cost advantage. A feature of our assumptions about price-elasticity is that we can charge such a large premium over the market average and still write sufficient business to cover our overheads. This means that our profitability is maximised at a larger price and relatively low volume. We believe that this is a valid assumption at least in the Personal market. Whether this can be extended to the Large Corporate market is a different question.

As well as agreeing the base values for the model's parameters, our initial work for this session was taken up by checking the formulae within the model structure. This involved two steps: first, checking that the assumed relationships were reasonable – a process requiring input from other members of the sub-group who had not constructed the model; second, checking that these relationships were reproduced faithfully within the model's formulae.

The main changes to last year's model brought about by this process are summarised below.

1 Correcting Retail Price in Global Results sheet.

2 Inflation assumptions separate for each component of expense

- Rename "Expense Inflation" to "Retail Price Inflation". This can be used quite readily where we need effects in real terms, for example:
  - Market Lapse/Switch/New Prospect Rate (in Inputs sheet)
  - Basic Persistency Rate (in each Cohortx sheet)

3 Incorporating the market price into our basic lapse rate.

- Instead of using the ratio between our absolute prices (assumes no market effect), allow part of the effect to be purely our (real) price change, and partly our change relative to that of the market.

4 Weights in more complicated formulae.

- We added two types of parameter to these factors. The first is a weighting parameter (0<=Z<=1) whereby the effects of advertising and commission can be weighted by Z and (1-Z) respectively. The second is an exponential scaling factor, so that the effect of ratios of this year's value to last year's value for given factors can be scaled. This could conceivably take any value, but a positive value of the order of 1 seems sensible. The factors to which this is applied are the NHS satisfaction index, and the market price.
- For Number of Salesmen Staying On From Last Year, the weighting parameter affects training and commission, while the scaling factor affects the importance of distribution effort.
- For Basic Persistency Rate, these changes are combined with those described in 3.

5 Renewal Scaling Factor.

- We now assume that a life which has not claimed for two years behaves much like one that has never claimed. The scaling factor was based on P(having claimed ever), but is now based on P(having claimed in the past two years).

6 Anti-selective lapsing.

- The original model had constant durational factors for claims, even though we had a fairly sophisticated approach to the effect of claims history on lapse behaviour. We have therefore extended this approach so that claims history affects future claims behaviour too. The input parameters are set so that the model as it stands emulates the kind of durational effect that we would expect to see for underwritten business. However, it now has the ability to test more extreme selective lapse spirals.

The version of the model that we have published is the bench-marked, "base" model.

3: INTRODUCTION TO SCENARIOS TESTED

Introduction

While the model was being validated and bench-marked, the members of the sub-group pooled their views on scenarios that it would be interesting to test. This section lays out our thoughts on how we intended to use the model to simulate the scenarios that were suggested by members of the sub-group, as well as to describe the output from the model that we planned to consider. The output from our initial thinking is reproduced in the remainder of this section.

We split the proposals into two categories: the first (A) required (or so we expected) only changes in the values of variables, while the second (B) might require some structural changes in the model.

Scenarios

- Introduction of new rating factors (e.g. Preferred life strategy). **A**
- Delay starting for 6 months (to test break-even period). **A**
- Higher spend on hospital negotiations. **A**
- Group vs. Individual business. **A**
- Claims payment delays changing over time. **A**
- The underwriting cycle. **A**
- Market reaction to our entry (existing players and others joining in). **A**
- Effect of stiff competition on weaker market players. **A**
- Effect of reduction of State cover. **A**
- Opportunities for more benefits. **A**
- Regulation, requiring more training, higher sales staff turnover, higher costs of materials. **A**
- Aggressive initial pricing to follow the durational effect. **A**
- Long-term contracts. **B**
- Extra cover for a higher cost (e.g. include chronic). **B**

Modelling

The next section considers the work that we have done in testing the "A" scenarios.

4: "A" SCENARIO RESULTS

Layout

This section contains the main body of our work this year. We have used the model developed last year, reviewed and refined in the early part of this year, to test scenarios that we thought may be interesting or informative. Each scenario is introduced separately, with a general description of the scenario, discussion of the parameter and other changes that we made to model the scenario, presentation of the important results (usually compared with the output from our "base" model), and some conclusions.

Introduction of new rating factors (e.g. Preferred life strategy).

If we segment the market, our initial premiums should change relative to the market's. In some segments, they will drop below the market's, and in others they will increase. Let us assume that we are to take the approach of identifying one segment where we believe that the market is over-priced. We shall set our rates for this segment more closely to what we believe is the "true" price, and concentrate on selling there. We shall concentrate our marketing efforts on selling into this segment, and for the purpose of this exercise, assume that we sell no business into the under-priced segment. It is likely that we have priced ourselves out of the market here anyway, and we shall make no effort to acquire business.

If we take this approach, our target market volume will fall. For example, if we introduce one new factor with two levels, it could halve. Because of the way the model is constructed, we have to allow for this reduction in market size by reducing the standard number of sales per salesman. This can be justified by recognising that, in the reduced market, the salesman has a reduced probability of reaching a good prospect with each call he makes.

To achieve the segmentation we may have to spend more on underwriting, with implications for our costs and for the barrier to sales. In fact we have identified two separate scenarios. In the first, we can achieve the segmentation through pricing, using a new rating factor, or exploiting cross-subsidies across or within levels of an existing factor. A good example of this might be to remove the cross-subsidy that the market operates between younger and older lives. This rating factor is easily collected, and should cost us no more and cause no extra problems at the point of sale. The second scenario considers the case where we can only identify members of this niche by collecting extra information that is more difficult to obtain. This could be health-related information, obtained and used by an innovative underwriting process. In this case, we do assume that the approach costs more and hinders sales, but we also assume a greater benefit in reducing the overall claims cost of our book.

The market loss ratio for our segment should be lower than average; we shall see this in lower claims frequency and overall cost. We might also expect an effect on our lapse rates: select lives will not find better rates elsewhere, so should persist for

longer; less healthy lives will be tied in anyway (as currently), so overall lapse rates drop and the selective nature of lapses should be less marked.

Although we have identified a niche, we may not necessarily price to meet the expected cost in the niche. We have therefore selected four pricing levels within each of the two scenarios described here, with effects changing as our pricing becomes more aggressive. It should be noted that, as a starting point, we are assuming that we are over-priced relative to the market. This was necessary because of the various factors that were working against us. Our rates have to exceed the market's because our costs are higher. We can get away with this over-pricing because we make enough margin on what we do sell to make up for the low volumes.

Scenario A: simple rating factor, small improvement in claims cost.

Step 1: The first step is to halve the market size (and number of sales per salesman), and to reduce the market loss ratio from 75% to 65%. We do not change our price, so are still charging on average 30% more than the market. We therefore expect no improvement in general persistency.

Step 2: Now we reduce our price, broadly in line with the improved claims cost, so that we are 20% above the market. We assume a consequent small improvement in basic persistency, from 80% to 81%.

Step 3: In this step, we reduce our price to be in line with the market's, and this improves our basic persistency to be closer to overall market persistency, at 85%,

Step 4: Finally, we price 10% below the market, assume that this improves overall persistency, and that it reduces the selective nature of lapses that we do see. As well as an overall persistency rate of 85%, we reduce the persistency gap between claimants and non-claimants by 20%.

Scenario B: complex rating factor, large improvement in claims cost.

Step 1: This is much the same as the first step in Scenario A. However, we reflect our greater improvement in claims cost with a market loss ratio of 55%. This is accompanied by a steeper durational slope, afforded by assuming a lower relative claim frequency for non-claimants. In addition, we reflect the greater difficulty of collecting the information by reducing the number of sales per salesman. We also move the sales barrier up from 75% to 100% and double the underwriting cost.

Steps 2-4: The remaining steps are to Step 1 as the remaining steps from Scenario A are to Step 1 of that scenario.

Summary of Results

Let us compare some key outputs, which demonstrate the effects that we are considering. We shall look at the following for each scenario and step:

- Total Lives in Force
- Persistency Rate
- Claim Frequency
- Variable Expenses
- Shareholders' Cashflows

Volumes

Total In Force (Lives)										
	Year									
Scenario/Step	1	2	3	4	5	6	7	8	9	10
Base	4663	8239	11264	14037	16698	18549	19941	21047	21951	22696
A1	2332	4119	5624	6992	8293	9177	9822	10316	10706	11015
A2	3213	5700	7809	9735	11573	12840	13775	14499	15075	15536
A3	5857	10567	14674	18507	22215	24914	27003	28690	30077	31224
A4	6378	12591	18767	25030	31452	37032	42018	46570	50777	54691
B1	1399	2472	3362	4154	4893	5371	5696	5929	6099	6225
B2	1928	3420	4668	5783	6825	7508	7980	8319	8569	8757
B3	3514	6340	8769	10983	13075	14521	15564	16345	16942	17401
B4	3827	7555	11231	14904	18605	21727	24416	26777	28875	30753

In the base scenario, we see steady growth in the book, as we write a steady stream of new business each year. Volume reaches an equilibrium level when total lapses are equal to the new business written in the year. This effect is perhaps better seen if we look at the annual growth rate, shown in the table below.

Growth Rate										
	Year									
Scenario/Step	1	2	3	4	5	6	7	8	9	10
Base		77%	37%	25%	19%	11%	8%	6%	4%	3%
A1		77%	37%	24%	19%	11%	7%	5%	4%	3%
A2		77%	37%	25%	19%	11%	7%	5%	4%	3%
A3		80%	39%	26%	20%	12%	8%	6%	5%	4%
A4		97%	49%	33%	26%	18%	13%	11%	9%	8%
B1		77%	36%	24%	18%	10%	6%	4%	3%	2%
B2		77%	36%	24%	18%	10%	6%	4%	3%	2%
B3		80%	38%	25%	19%	11%	7%	5%	4%	3%
B4		97%	49%	33%	25%	17%	12%	10%	8%	7%

In Step A1, we see a much lower initial volume than Base, because of the massive reduction in the size of our target market, and hence salesmen's opportunities. The overall growth rate slows down more rapidly, but only marginally, because the opportunity for new sales is also restricted. Step A2 shows a better initial volume, because of the lower price. This is followed by very similar growth, with a slight improvement in persistency, again because of the lower price relative to the market. Step A3 shows even higher initial volumes than Base, despite the smaller target market. This is principally because of the better pricing, allowing salesmen to make much more of their restricted sales opportunities. Step A4 shows a slight improvement on this, but with much more of a discount against the market it is likely that these volumes would not increase any more, as our pricing lost credibility. Where Steps A3 and A4 do show a significant improvement is in the growth rate, where improved sales are accompanied by better persistency, so that in the extreme, ultimate volumes are roughly double those in the base scenario.

We can see a similar progression in the Scenario B Steps, although volumes are consistently lower than for the A Steps. For each Step, Scenario A and Scenario B represent the same retail price, but Scenario B has much more complicated underwriting, so volume is more difficult to achieve. Again, moving from Step 1 to Step 4 we see improving overall growth (from a lower starting point), as persistency improves.

Persistency

Persistency Rate										
	Year									
Scenario/Step	1	2	3	4	5	6	7	8	9	10
Base	0%	60%	61%	63%	64%	65%	66%	67%	67%	68%
A1	0%	60%	61%	62%	63%	64%	65%	65%	66%	67%
A2	0%	61%	62%	63%	64%	65%	66%	66%	67%	68%
A3	0%	64%	65%	66%	67%	68%	69%	70%	71%	71%
A4	0%	81%	82%	82%	83%	84%	85%	86%	86%	87%
B1	0%	60%	61%	61%	62%	62%	63%	63%	64%	64%
B2	0%	61%	61%	62%	62%	63%	63%	64%	64%	65%
B3	0%	64%	64%	65%	66%	66%	67%	67%	68%	68%
B4	0%	81%	81%	82%	82%	82%	83%	84%	84%	84%

In both Scenarios, persistency improves gradually from Step 1 to Step 4. This is not surprising, as we have hard-keyed an improvement in initial persistency as the price falls relative to the market. In Step 4 we see much improved overall persistency, driven by a marked improvement in persistency amongst non-claimants. As we retain more non-claimants, overall persistency does not increase as rapidly as in the base scenario because the overall rate is more heavily influenced by these non-claimants. Although we have allowed for an improvement in non-claimant persistency, this is still lower than claimant persistency in all Steps. Step for Step, Scenario B shows slightly lower persistency than Scenario A. The main driver behind this is the heavier weighting throughout Scenario B towards non-claimants, which itself is linked to the lower loss ratio that we have assumed for this Scenario.

Claim Frequency

Number of Claims per Life per Year										
	Year									
Scenario/Step	1	2	3	4	5	6	7	8	9	10
Base	9.38%	11.60%	13.87%	15.83%	17.49%	18.88%	19.85%	20.49%	20.79%	21.03%
A1	8.13%	9.91%	11.72%	13.28%	14.58%	15.64%	16.36%	16.82%	17.01%	17.15%
A2	8.13%	9.91%	11.73%	13.29%	14.61%	15.68%	16.41%	16.88%	17.07%	17.22%
A3	8.13%	9.92%	11.77%	13.37%	14.73%	15.85%	16.61%	17.11%	17.33%	17.51%
A4	8.13%	9.96%	11.96%	13.73%	15.27%	16.55%	17.44%	18.06%	18.36%	18.61%
B1	4.76%	5.79%	6.84%	7.74%	8.50%	9.11%	9.51%	9.76%	9.86%	9.93%
B2	4.76%	5.79%	6.85%	7.76%	8.51%	9.13%	9.54%	9.80%	9.89%	9.96%
B3	4.76%	5.79%	6.87%	7.80%	8.58%	9.22%	9.65%	9.93%	10.04%	10.12%
B4	4.76%	5.82%	6.99%	8.02%	8.92%	9.66%	10.18%	10.54%	10.71%	10.85%

Base claim frequency increases year on year. This is driven by two factors: first, there is an underlying upwards trend in overall claim frequencies; second, claim frequency within a cohort of business increases year on year, as the effect of underwriting "wears off". At first, these two effects combine to give steep early increases in frequency; as the portfolio stabilises, this growth rate falls off, tending towards the underlying growth rate only.

Scenario A initial frequencies are the same for all Steps: this is driven directly by our assumed loss ratio. Similarly, Scenario B frequencies are the same for Year 1, but lower than Scenario A frequencies, as we have assumed a lower loss ratio. In the table below, we can see how the average claim frequency grows for each Scenario and Step.

Growth in Claim Frequency										
	Year									
Scenario/Step	1	2	3	4	5	6	7	8	9	10
Base		24%	20%	14%	11%	8%	5%	3%	1%	1%
A1		22%	18%	13%	10%	7%	5%	3%	1%	1%
A2		22%	18%	13%	10%	7%	5%	3%	1%	1%
A3		22%	19%	14%	10%	8%	5%	3%	1%	1%
A4		22%	20%	15%	11%	8%	5%	4%	2%	1%
B1		21%	18%	13%	10%	7%	4%	3%	1%	1%
B2		22%	18%	13%	10%	7%	4%	3%	1%	1%
B3		22%	19%	14%	10%	7%	5%	3%	1%	1%
B4		22%	20%	15%	11%	8%	5%	3%	2%	1%

All Steps show lower initial growth than the Base Scenario, because the lower base claims frequency means that fewer policyholders make the transition from non-claimant to claimant each year. The reduction in frequency growth, however, slows down marginally from Step 1 to Step 4. This is the result of a change in the overall mix of claimants and non-claimants as the retail price affects overall persistency and new business. Step 4 of both Scenarios shows more sustained growth in average claim frequency. This is despite the improved underwriting effect that we expect, and demonstrates that one of the prices we pay for improved persistency is a higher stable level of claims. However, the effect is minimal compared with the overall improved claims experience we see by underwriting more effectively.

Variable Expenses

In all the Scenarios that we consider, fixed expenses tend to dominate the picture for many years. We can see the overall effect in Shareholders' Cashflows below, but it is also interesting to see how variable expenses change with each Step we take. Variable expenses are by definition volume-driven, so the main difference that we see between the steps relate to the volumes of business in force. It is more interesting to consider these expenses per policy in force.

Variable Expenses per Policy in Force (£)										
	Year									
Scenario/Step	1	2	3	4	5	6	7	8	9	10
Base	118	126	137	148	157	165	171	175	179	183
A1	118	126	137	147	156	164	170	175	178	182
A2	112	119	129	139	148	155	160	165	169	172
A3	99	106	115	123	131	137	142	146	149	152
A4	93	98	105	113	119	125	129	133	136	139
B1	137	146	157	168	178	186	192	198	202	207
B2	131	139	149	160	169	177	183	188	192	197
B3	119	126	135	144	152	158	164	169	173	177
B4	112	118	125	133	140	146	151	155	159	163

Variable expenses per policy increase steadily each year with inflation, both of the expenses themselves, and of premium (which drives commission). With each Step, variable expenses per policy drop, because lower premiums give rise to lower commissions. For Scenario B, variable expenses are higher than for Scenario A, because of the higher cost of underwriting the business.

Variable Expenses per Premium in Force (£)										
	Year									
Scenario/Step	1	2	3	4	5	6	7	8	9	10
Base	23%	22%	21%	21%	21%	20%	20%	20%	20%	20%
A1	23%	22%	21%	21%	20%	20%	20%	20%	20%	20%
A2	24%	23%	22%	21%	21%	21%	21%	21%	21%	21%
A3	25%	24%	23%	23%	22%	22%	22%	22%	22%	22%
A4	26%	25%	24%	23%	23%	22%	22%	22%	22%	22%
B1	27%	25%	24%	24%	23%	23%	23%	23%	23%	23%
B2	28%	26%	25%	24%	24%	24%	23%	23%	23%	24%
B3	30%	29%	27%	26%	26%	25%	25%	25%	25%	25%
B4	32%	30%	28%	27%	26%	26%	26%	26%	26%	26%

If we consider these expenses as a proportion of premiums, we see a different effect. The expense ratio falls year on year as premium inflation outstrips expense inflation. The expense ratio increases from Step to Step as the premium is reduced but per policy non-commission expenses do not. Scenario B shows consistently higher variable expense ratios than Scenario A because of the extra underwriting costs.

Shareholders' Cashflows

Shareholders' Cashflows (£)										
	Year									
Scenario/Step	1	2	3	4	5	6	7	8	9	10
Base	-1,326,958	-870,665	-617,670	-347,873	-115,619	465,640	751,808	895,340	1,036,206	1,045,635
A1	-1,191,603	-886,830	-737,952	-557,154	-368,259	157,989	433,860	611,195	748,208	807,410
A2	-1,223,874	-931,418	-738,870	-542,123	-334,627	250,061	537,448	714,289	867,151	925,565
A3	-1,434,202	-1,195,645	-1,135,067	-1,048,023	-999,655	-573,739	-389,598	-321,615	-233,816	-275,577
A4	-1,515,034	-1,556,040	-1,815,118	-2,095,085	-2,539,766	-2,629,133	-2,903,831	-3,281,935	-3,563,911	-4,176,063
B1	-1,211,946	-774,229	-708,151	-512,936	-308,016	206,464	462,061	624,830	741,146	798,398
B2	-1,200,406	-764,486	-594,608	-325,814	-42,798	558,407	881,721	1,092,666	1,248,043	1,329,913
B3	-1,215,976	-830,239	-475,941	-84,136	334,592	1,124,911	1,586,884	1,894,721	2,134,632	2,267,567
B4	-1,257,748	-989,865	-691,290	-306,113	177,991	1,026,932	1,619,249	2,079,458	2,497,148	2,781,774

The overall effect of these different approaches can be seen in the way that they affect shareholders' cashflows. Negative cashflows mean that more investment is required. At first, most of this investment is in infrastructure, but as volumes are put on slowly, expense over-runs and solvency margin requirements begin to dominate, until eventually (in some cases) profits start to come out and the investment begins to be repaid.

All the steps require similar levels of initial investment: that is one of our base assumptions. However, the rate at which negative cashflows become positive ones depends on our selected strategy. Let us consider Scenario A first. Here we have an ability to select risks; this affords us a claims cost advantage over the base scenario. If we do not price for this advantage, we end up with lower marginal costs, but much lower volumes, so our fixed costs dominate and we lose even more money. Step A1 shows this. If we decide to allow for our savings in our rates, we can increase volumes at the expense of marginal revenues, and Step A2 shows that this can improve the picture over Step A1. However, if we go too far, the combined effect of extra volumes and lower prices means that each policy no longer makes a marginal contribution, and we soon reach a point where we can never make a profit (Step A3). Step A4 shows that we have gone far too far and are in fact making marginal losses here.

Scenario B looks more optimistic. Step B1 is not very much different in outcome from Step A1. The play-off between lower claims costs and lower variable expenses, combined with lower volumes, gives similar results. However, as we reduce prices, things improve. This is for two reasons: first, we have more claim cost saving to play

with, so we can bring rates down much further and still make a marginal profit; second, as we bring these rates down, our volumes improve so much that we end up able to cover our fixed expenses easily as well. Step B4 shows an extreme (and admittedly idealistic) situation, where we have been so successful in selecting risks that we can afford to under-cut the market by just enough to achieve high volumes of still profitable business.

Conclusion

The results of this exercise are fairly intuitive. It could almost be argued that our prior assumptions were self-fulfilling, but this is actually quite satisfying, because it means that the model is working well. Without modifying our initial approach very much, we have managed to make the model reproduce outcomes for each of our strategies that are entirely consistent with what we would expect. This exercise has therefore served two purposes: first, we have demonstrated that the model produces sensible results when we change some of the most important parameters; second, we have learned something about the way our actual results might depend on the strategy that we use to enter the market.

Of course, this has been something of an over-simplification. It is left to the interested reader to extend these scenarios to test, for example, the competition's reaction to our strategy, and the effect that this might have on the characteristics of the market that we are targeting.

Delay starting for 6 months

Description

In this scenario we are trying to model the effect of a delay to the launch date of six months. Fixed costs will not change and semi-variable expenses such as the cost of maintaining the distribution network will not change much, but we will not start writing business until six months have passed.

Changes Made to Model

We can model the effect of delaying starting for 6 months by assuming that 'year 0' actually lasts for 18 months, and increasing the fixed and semi-variable expenses which occur in this initial period accordingly. The cashflows for year 1 onwards are discounted for a further 6 months and the cashflows in the initial period are assumed to occur half-way through the period, i.e. at 9 months rather than at 6 months, so are discounted for a further 3 months.

The following changes were made to expenses incurred in the initial period:

- Assume that the number of salesmen reduces in the initial period by 10% multiplied by the proportion of the year that we delay starting. The number therefore reduces by 5% if we delay starting for 6 months. This is because some salesmen will become disillusioned by the delay. This therefore increases the number of salesmen we need to recruit in the first year.
- The sales training cost in the initial period is increased by the proportion of the year we delay starting, as this represents an ongoing training cost.
- The cost of maintaining the distribution network is increased by the proportion of the year we delay starting, as it will still need to be maintained.
- The hospital negotiation cost is increased by the proportion of the year we delay starting, as contacts with the hospital would need to be maintained with discussions continuing over the period of delay.
- Marketing and advertising expenditure are assumed not to increase as we will be able to delay spending in these areas until we are sure that we are about to launch. An alternative would be to increase these costs, in other words to assume that we were unable to halt some of the spending.

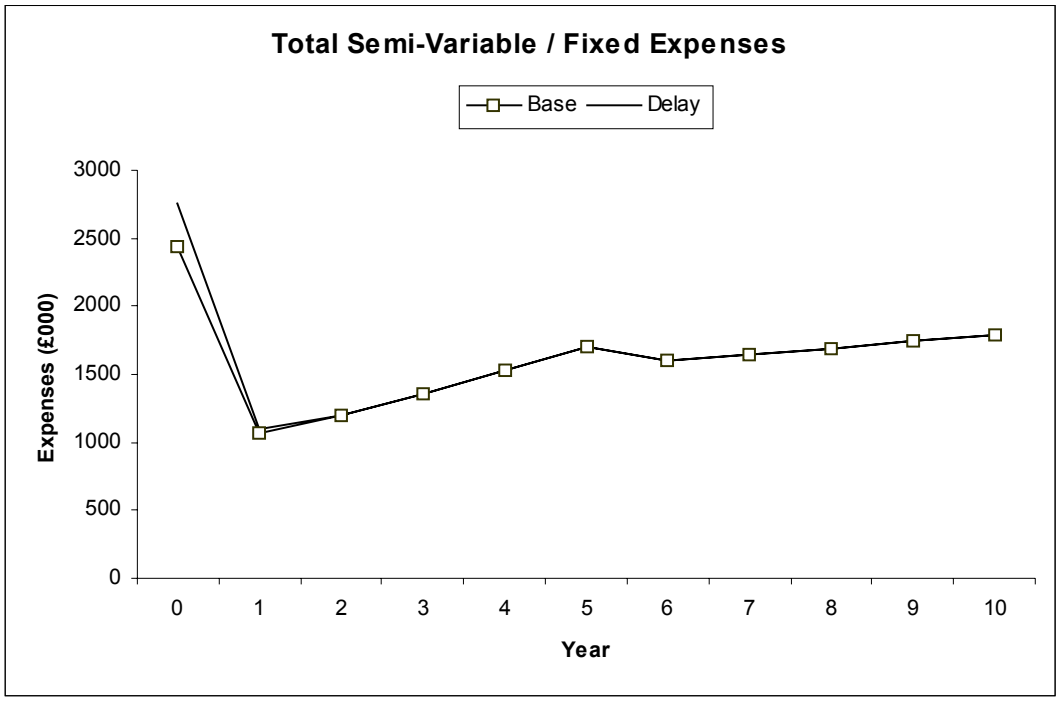
Results

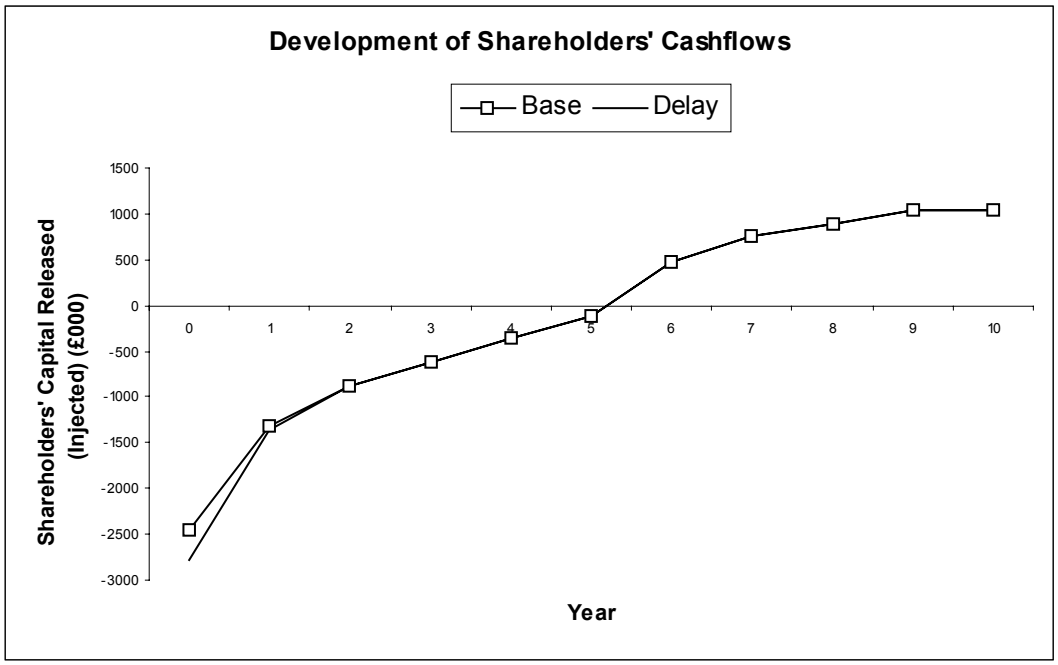
Net Present Value of Shareholders' Cashflows

base	-£1,441,318
delay	-£1,757,075

The results show that there is effectively an increase in expenses in the initial period and that this feeds through into shareholders' cashflows and then into a reduction in the Net Present Value (which is tempered by discounting initial cashflows by a further 3 months and later cashflows by a further 6 months).

Apart from the effect of having to recruit more salesmen in the first year and discounting the future cashflows for a further 6 months, there are no other impacts on the model.


Total Semi-Variable / Fixed Expenses
Base
Delay
Expenses (£000)
3000
2500
2000
1500
1000
500
0
0
1
2
3
4
5
6
7
8
9
10
Year


Development of Shareholders' Cashflows
Base
Delay
Shareholders' Capital Released (Injected) (£000)
1500
1000
500
0
-500
-1000
-1500
-2000
-2500
-3000
0
1
2
3
4
5
6
7
8
9
10
Year

Hospital Negotiation Spend

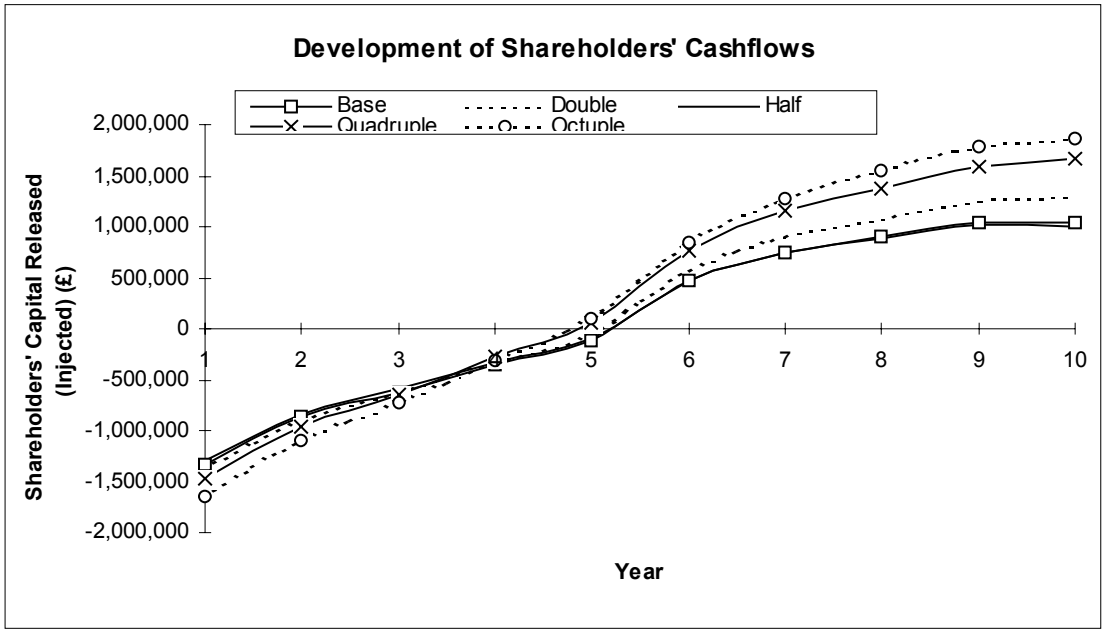
If we spend more effort in negotiating hospital prices, we should expect to see greater rewards as these prices move closer to the best available in the market. However, we will always be limited in our bargaining power by the volumes of business that we can promise to the providers, so that a law of diminishing returns will apply to our negotiation spend.

To test this, we have considered the effect of doubling the hospital negotiation spend each year.

Summary of Results

The negotiation spend comes through the model as a semi-variable cost, so affects only the shareholders' cashflows directly. The benefits (reduced claims costs) are visible in reduced loss ratios, but more interesting is the combined effect. We shall therefore only consider shareholders' cashflows.

Shareholders' Cashflows and net present values



The pattern of shareholders' cashflows is fairly constant, as is the way that this pattern evolves as we keep doubling the spend. As the spend increases, early cashflows are more negative, as we spend far more than we can benefit from because of low volumes of business This means that a higher negotiation spend only serves to deepen our losses in the early years. As business volumes increase, we gain a double benefit from spending more. First, the aggregated value of the discounts gained increases because we have more policyholders and therefore more claims. Second, the benefit we gain from spending more increases as we can promise more volume to providers.

As well as the general steepening of the curve, we can also see that successive doubling of the spend gives an initially rapid rate of gain for later years, but that this

rate declines. An optimal rate of spend would be found when this rate of benefit falls to zero (before becoming negative). Of course the point at which this happens will depend on many other factors, but for our base scenario we have made an attempt at finding the optimal point for the later years; this appears to be represented by the "Quadruple" curve above. In the early years, the optimal spend is very close to zero. We can see this in the net present value results below, where the "Optimum" scenario is the same as the "Quadruple" scenario, but with no hospital negotiation spend in the first four years..

Strategy	Net present value
Base	-£1,441,318
Double	-£1,152,414
Half	-£1,365,000
Quadruple	-£618,538
Octuple	-£818,697
Optimum	-£576,529

In conclusion, there is probably little point in expending any effort on negotiating hospital rates in the early stages of the venture. As volumes increase, the benefits begin to out-weight the costs, until we reach a point where spending any more becomes counter-productive.

This conclusion is accompanied by a *caveat*. The model only captures the effect of hospital negotiation spend each year, and makes no real allowance for the way that spend one year might affect results in subsequent years. In reality, there is a strong chance that what we do in the early years will have a strong influence on our success in later years. For example, if we set a precedent of making no effort in the first few years (as we have suggested above), then our ability to negotiate better prices in later years - when it is more important that we do - could be restricted severely.

Group Business Scenario

Description of Scenario

The group PMI market is quite different to the individual market. Generally it operates like many other group insurance markets, ie, it is more commodity based, there is high volume of people covered, a competitive market and thin margins. One key point with group PMI is that the premiums can still be quite substantial.

Changes Made to Model

This scenario requires a number of significant changes to the parameters in the model. The changes between the base scenario (individual business) and option 1 (group business) are shown in the following table.

Parameter	Cell Ref*	Individual Business	Group Business	Rationale
Market Retail Price Year 0	A5	350	300	Lower average cost due to lower incidence in bulk scheme
Proportion of Premiums payable monthly	A10	80%	100%	Assume all group schemes pay monthly
Advertising vs. Commission Importance	A18	0.50	0.25	Commission is more important in a broker dominated market
NHS Index Importance	A19	1	0.5	NHS less important in this market
Our Price relative to market influence on basic persistency	A21	0.50	0.75	Price more important in this market
Frequency Inflation	F18-O18	10% pa tapering to 0%	0%	Assume ultimate experience from day 1
Market Volume	F20-O20	1.8	3.6m	Total market for group
Commission	F29-O38	15% 1st year then 10%	2% each year	Typical group market commissions
Market Commission	F42-O51	15% 1st year then 10%	2% each year	Typical group market commissions
Proportion in our Customer Base	F59-O59	0.25	1	All market is potentially accessible
Market Loss Ratio	F65-	75%	90%	Finer margins on

	O65			group business
Expenses				
Policy Set-up	F69	£10	£5	Less policy
Policy Admin.	F73	£10	£5	administration
Underwriting expense	F68	£20	£0	No underwriting
Number of salesmen	F64	5000	5000	Counted in 1/100ths
Cost of one salesman	E76	£10000	£100	Per 1/100th salesman
Market Salesman cost	E77	£10000	£100	Per 1/100th salesman
Salesman Recruitment cost	E78	£15000	£150	Per 1/100th salesman
Renewal Scaling Factors				
Claimed	F91-	1.25	1	Irrelevant due to
Not Claimed	O92	0.75	1	experience rating
Claim Scaling Factors				
Claimed	F98-	2	1	Irrelevant due to
Not Claimed	O99	.65	1	experience rating

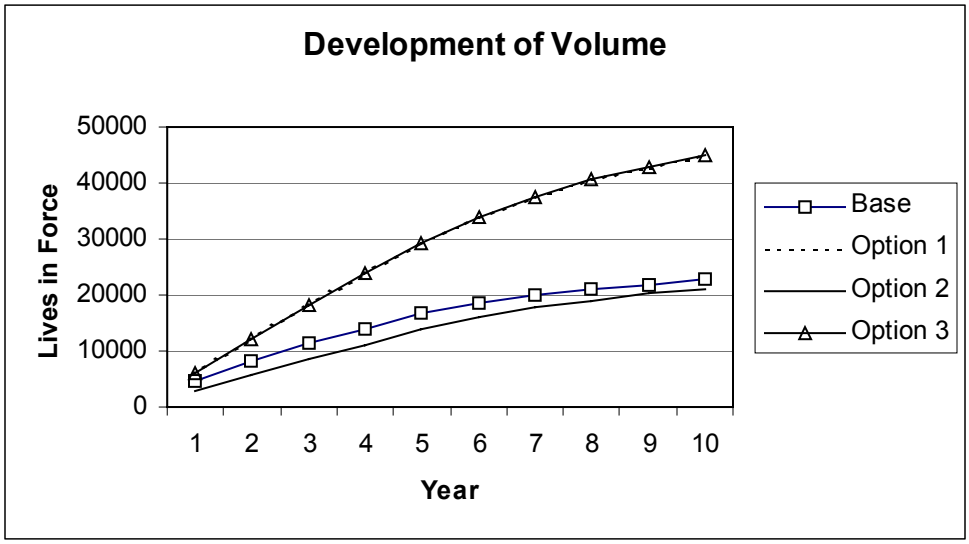
* Cell Ref is the cell in worksheet "Input" in the excel workbook.
Note that in order to fit the model, we have assumed that the salesmen are counted in 100ths. This is because the salesmen in this market can be much more productive.

Option 1 is the basic group business model. This is then adjusted to get options 2 and 3. Option 2 represents the situation where a higher price is offered; 150% of the market versus 130% of the market. Finally, option 3 shows what happens if the margins are thinner with the market loss ratio at 93%.

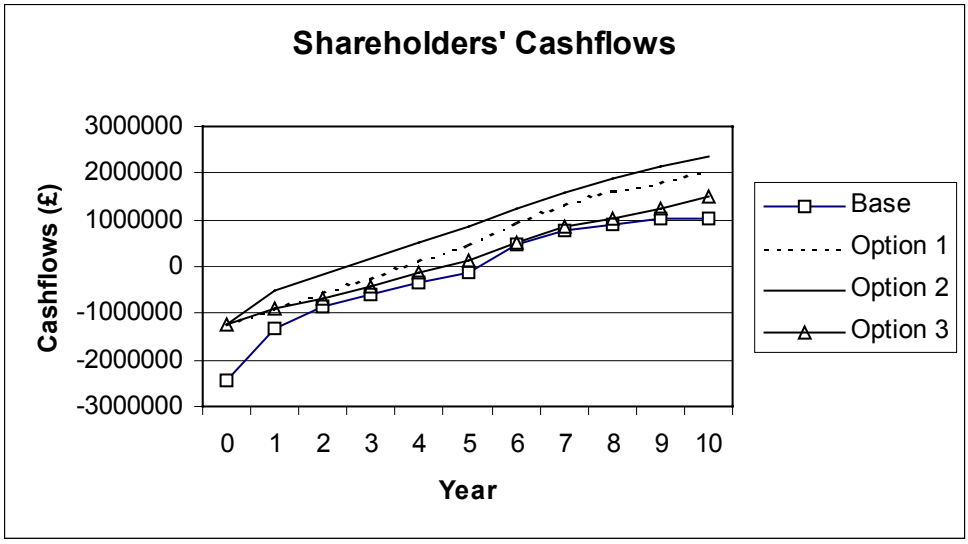
Results

All three group options are profitable. Option 2 is the most profitable as the sacrifice in volume is more than offset by the increase in profit. Option 3 shows that profit can disappear rapidly in a competitive group market.

	NPV of Cashflows
Base	-£1,441,317
Option 1	+£3,674,768
Option 2	+£4,565,359
Option 3	+£1,995,804



In considering the shareholders' cashflows, it is clear that the group situation requires less capital as there is less commission and underwriting expense at the front end of the contract. On the other hand, margins can be slim as illustrated in option 3.



Comments

The options indicate that this business would be clearly more profitable than the individual business. It is not clear that this would always be the case.

The Underwriting Cycle.

Consider more capital entering the market. This would represent a down-turn in the cycle (the opposite applies to the other side of the cycle). The main consequences of this influx would be:

- The market price falls and loss ratios increase. With unchanged underlying claims experience, we have allowed the market price to vary so that the market loss ratio cycles around its trend with an amplitude of 10% of premiums.
- Market advertising increases. We have allowed this to vary by +/- 10%.
- Market commissions go up. We have allowed initial commissions to vary by +/- 5% of premium, and renewal commissions by +/- 2.5% of premium.
- Salesman turnover increases. We have allowed this to vary by +/- 5% of total salesmen.
- Salesman costs increase (more demand from more players). These vary by +/- 10% of the underlying cost trend. Cost of recruiting salesmen changes similarly.

All these items are adjusted in the primary inputs to the model. We would also expect the following effects to emerge from the model itself:

- Lapse rates fall.
- New prospect rates increase.
- Switch rates change. This will be the result of two conflicting effects: a greater tendency to switch as commissions and marketing expenditure increase, off-set by a greater tendency to stay with the same insurer as underlying price increases are mitigated by more competitive pricing approaches.
- Changes to total volumes will follow from these changes.

As well as these market changes, we can model our strategy within the cycle, i.e. do we follow it or ride it? It may be more difficult for a PMI writer to ride the cycle because any lapses seen in a down-turn would be selective.

We have modelled two scenarios: in the first, we follow the cycle. This means that variations in our price follow those in the market, as do variations in our own advertising spend and commissions. In the second scenario, we attempt to ride the cycle, so our price remains more steady, as do our marketing spend and commissions. In the cycle-riding scenario, we have still followed the market's salesman recruitment and maintenance costs, but with our required number of salesmen varying. This is to simulate our efforts to develop our business being hampered by the market's actions.

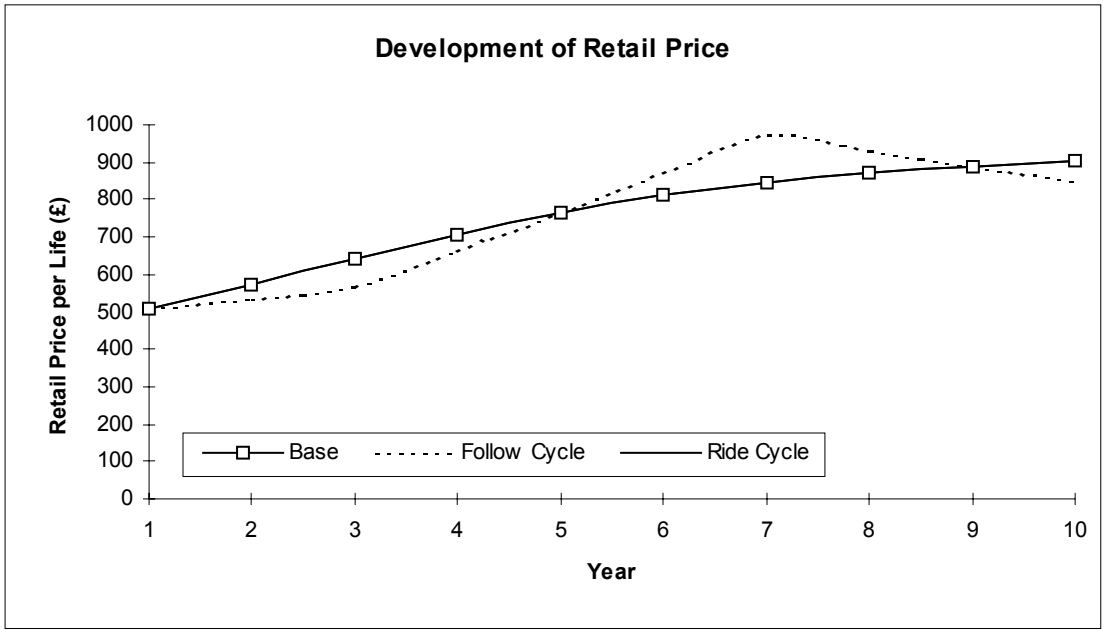
In each of these scenarios, we model a market at equilibrium in Year one, getting softer towards year three, hardening towards Year seven, with an overall period of eight years. This is not to suggest that the period of such a cycle is eight years, but it allows us conveniently to model a full cycle within the ten-year projection period of the model.

Summary of Results

Let us compare some key outputs, which demonstrate the effects that we are considering. We shall look at the following for each scenario and step:

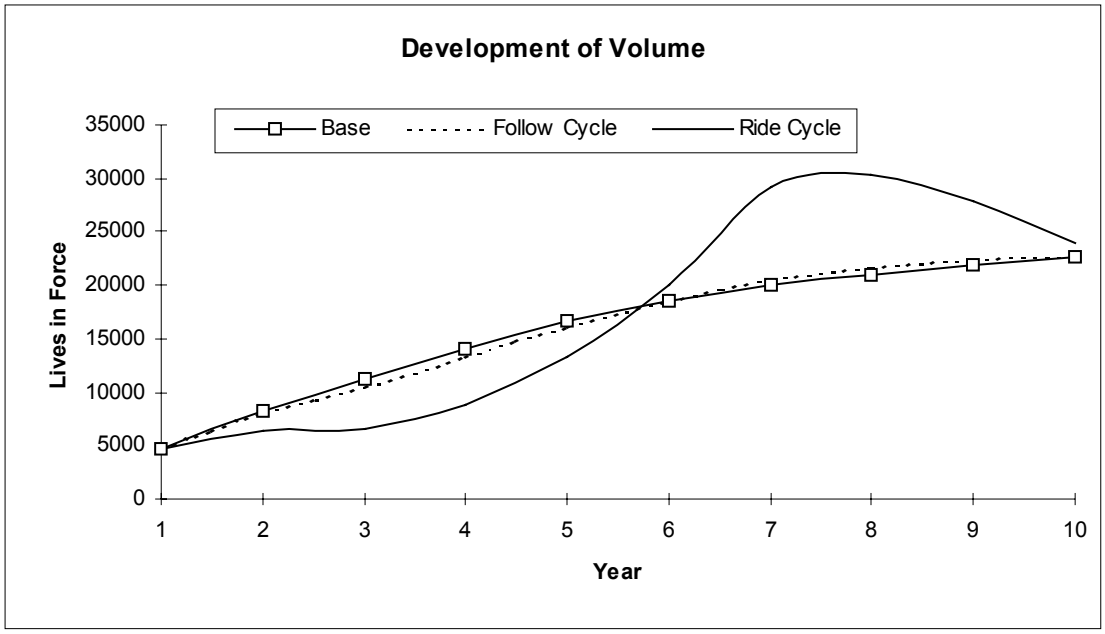
- Retail Price per Life
- Total Lives in Force
- Persistency Rate
- Claim Frequency
- Loss Ratio
- Shareholders' Cashflows

Retail Price



If we follow the cycle, our retail price does not increase initially as rapidly as base, but after Year three increases far more rapidly, so that by Year five we are back at the base market price. This accelerated increase continues before slowing down, so that we are back at the base market price at Year nine. If we ride the cycle, our retail price in each year is the same as for the base scenario.

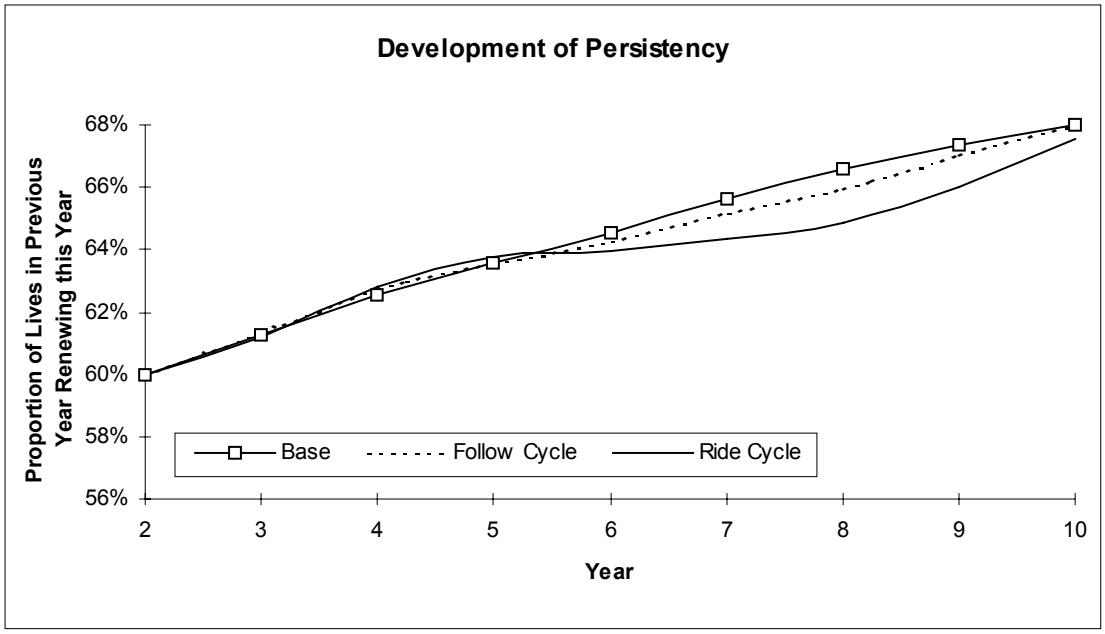
Volumes



Volumes in Year 1 are the same for all scenarios, because the market is at equilibrium here. If we follow the cycle, our growth each year is roughly the same as it would have been under the base scenario. There are slight differences because of the overall effect on the market of the cycle itself. When the market is very soft, we find it difficult to achieve our target growth even if we think we are being as generous as the market. When the market is harder, our growth is relatively higher for similar reasons.

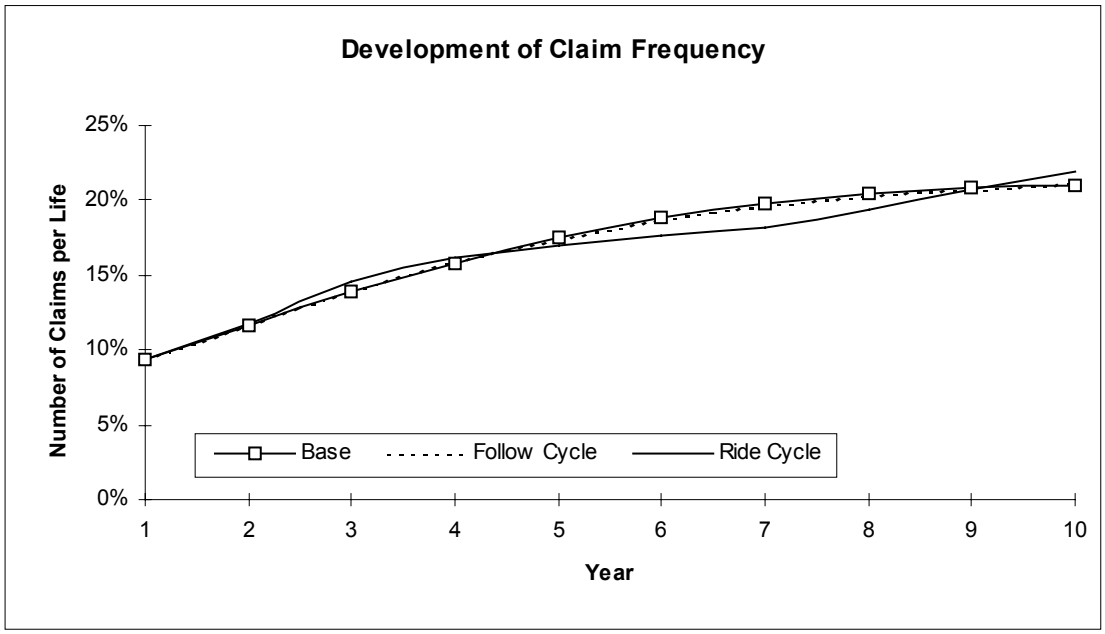
If we ride the cycle, our growth is much lower than base as the market softens, but picks up again as the market hardens. This is exactly as we would expect, because in a soft market we will seem far too expensive, while in harder market we will appear relatively cheap. Once we have achieved roughly steady-state volumes, we see our portfolio being eroded in Years 9 and 10 as the market softens, and we lose business to insurers who are heavily under-priced. Our volumes seem to vary at about +/- 10000 lives compared to base.

Persistency



There is very little difference in overall persistency for the three scenarios. This means that the very different growth rates we see are more the result of new business rates. This is really a question of how efficient the market is. The main argument in favour of our results is that while there may be a good deal of shopping around when people have decided to look for a new insurer, it actually takes quite a big change to make an existing policyholder move.

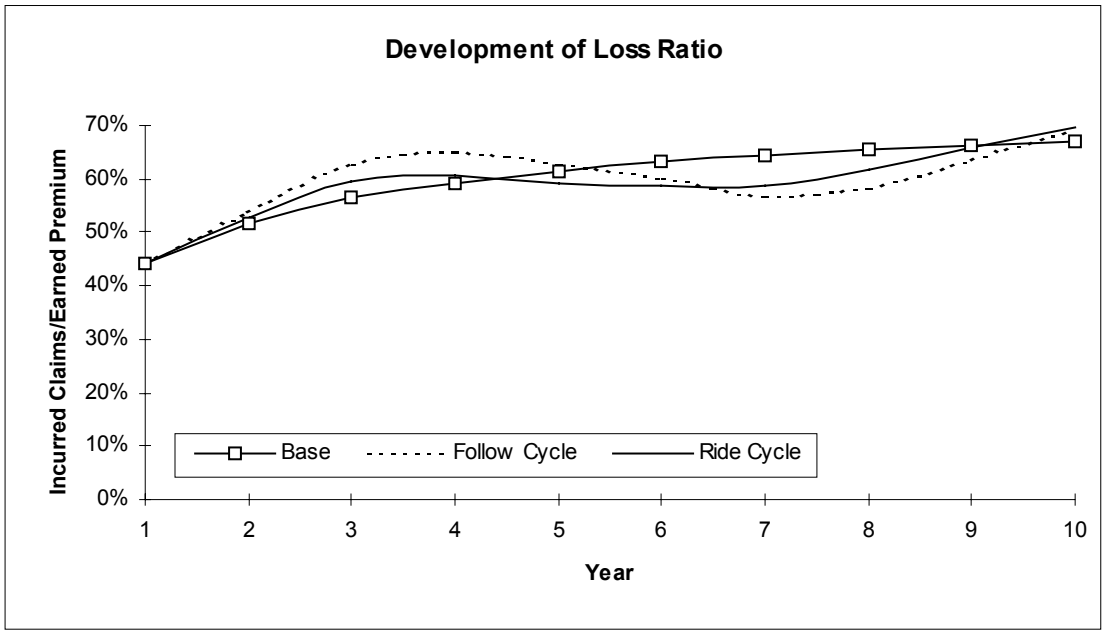
Claim Frequency



If we follow the cycle, our claim frequencies are very similar to base. However, if we attempt to ride the cycle, we see more variation. This is primarily a durational effect: as we are not growing so rapidly while the market is soft, a larger proportion of our

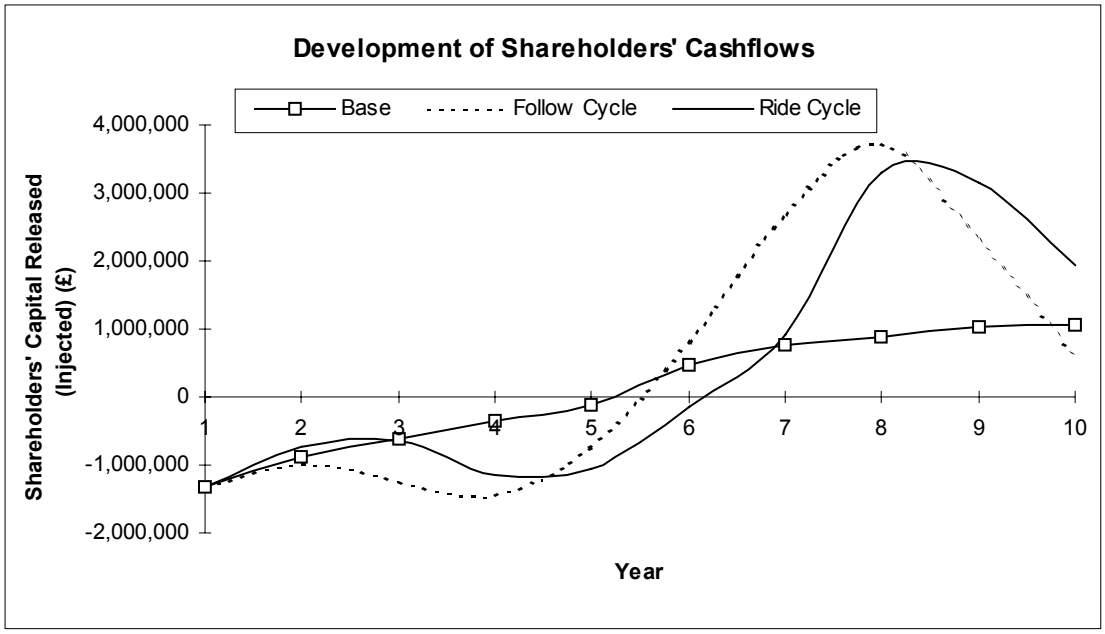
portfolio will be at longer durations, where we have assumed a relatively higher claim frequency. The average claim frequency is therefore higher. As the market begins to harden from Year 3 to Year 7 we see much better growth in new business, so our claim frequencies increase more slowly than in the other two scenarios. The net effect is for average claim frequency to be similar for all scenarios after one full cycle.

Loss Ratio



We can see two effects in our loss ratios. The first is the cyclical effect of the market loss ratio, making our own loss ratios higher in Year 3 and lower in Year 7 if we follow the cycle. The second effect is the durational changes in claims frequency that we saw above, meaning that if we ride the cycle, our loss ratios stay closer to the base scenario, but still cycle, one year ahead of the market loss ratios. We can also see that the loss ratio is tending to a higher equilibrium level when we ride the cycle: this is probably the result of the selective lapsing that we might expect as the market turns down again.

Shareholders' Cashflows



If we follow the cycle, we lose substantial amounts of money in the early stages of the business while we support very low prices in the hope of achieving volume. Once we have achieved that volume, and rates firm up again, we can make much more profit than was available in the base scenario. If we attempt to ride the cycle, our initial losses are lower, but not much lower, than if we had followed it. This is because the marginal profits that we make on the limited business that we do write are not nearly enough to cover our overheads, and we end up in pretty much the same position. When the market picks up again, we do begin to put on more volume, but this does not stay with us for very long, limiting our ability to recover early losses before the portfolio shrinks again.

The overall implication would seem to be that we should follow the cycle, rather than try to ride it. The other interesting (and unexpected) implication is that overall a cyclical market would be more profitable than a flat one. However, this is really a function the timing of our entry into the market relative to the cycle. We have limited exposure as the market turns down, but this grows as it picks up. If we had entered as the market was firming up, we would have made smaller initial losses, but would have been less successful in later years as the cycle turned down.

Market Reaction to our Entry

Another scenario that we had wanted to test was the possibility of the market reacting to our entry by becoming more aggressive. This could have taken the form of more capital coming in from new players (for example, if we are a retail bank, all the other banks may wish to copy our strategy), or defensive moves by existing players. When we considered how to change the input parameters to model this scenario, we realised that this effect would not be very different from the underwriting cycle. In fact, by choosing to enter the market as it was at equilibrium, but about to become softer, we have already covered this other scenario.

If we consider the results above, we could conclude that being followed into the market by other new entrants might not be a bad thing. It is true that our initial losses will be compounded by a soft market, but we shall be making our marginal losses on smaller volumes of business than otherwise, because these other players will be sharing the losses with us. When the market firms up, the weaker players will have withdrawn from the market, leaving us with greater volumes of business when marginal profits improve. This conclusion is counter-intuitive: we would normally hope to enter a market when conditions were very good. We can square the circle by recognising our fundamental assumption: we are not one of the weaker new entrants. Our ability to remain in the market to benefit from harder rates is directly related to our ability or willingness to sustain the losses from a soft market. Only if we can out-last our competitors will we be successful. The question is: how much are we prepared to lose before we tire of waiting for our competitors to tire of waiting for the market to harden? We leave the answer to this question as an exercise for the reader.

Existing Player Scenario

"consider the position of a large existing player compared with a smaller new entrant. The model is based on the smaller entrant now, so we need to consider differences for a big boy."

Overview

The model was developed to show the position of a marginal player in the PMI market. It would be useful to compare the position of such a marginal player with that of a large existing player.

Initially we tried to model this scenario by only changing the parameter inputs and not the underlying structure of the model. However several structural changes were required to accommodate such a large player.

We have modelled the run off of existing business and effect of new future business of the existing player.

Changes to the Model

Structure and Formulae Changes

We created a new variable called *propMarket* to represent the proportion of the market the large player had. This was set to 40%.

A formula was created to calculate the sales per salesman that takes into account the total market sales. This required calculating on the Global Calculations sheet the *Number Looking* for PMI cover. The existing formula for sales per salesman effectively was not linked to market volumes and resulted in more sales than market volumes for this scenario. This is discussed in more detail in Appendix D.

Sales Reach formula in Global Calculations was changed to correct an inconsistency. This resulted in a sales reach of .48 for the large player compared with around .05 for the base scenario.

A Cohort 0 sheet for existing business was created and we updated the result sheets to include this. We adjusted the formulae for year 1 of this cohort sheet to look up 'ultimate' values of various parameters.

We set existing business to *propMarket* * *Market Volume* and added *Market Share* to Global results sheet. We also set our hospital discount to market hospital discount, in Global Calculations.

Parameter changes

- Set price adjuster to 1 so that price = market price
- Commission set to market commission
- Annual advertising spend = 40% of market
- Brand strength was increased to 0.58 by iterating until market share was around 40%. This figure takes values between 0 and 1 and where 1 is infinite brand strength. This figure of around 60% for the large player is intuitively of the right magnitude.
- Reduced proportion of market already customers to 10% from 25%. Existing player's customer base may have less cross-sales than a new entrant (this could be argued the other way too, e.g. PPP now have Guardian's customer base).
- Number of salesmen set to 2000 (= 40% of Market total)
- Sales barrier increased to 1
- Set investments in year 0 in AccNet to £500,000,000.
- Halved the policy admin. costs to £5 and 1% respectively.
- Doubled the hospital negotiation costs to £100,000.
- Current investments of £500,000 were included in AccNet sheet.

Results

The results below show both the absolute results of this scenario and a comparison of each cashflow with that of the base scenario.

Net Present Value. The NPV worsened from -£1.2m to -£40m.

The loss ratios for the existing player remained almost level at around 75% compared with loss ratios starting at 44% and rising to 67% for the base scenario.

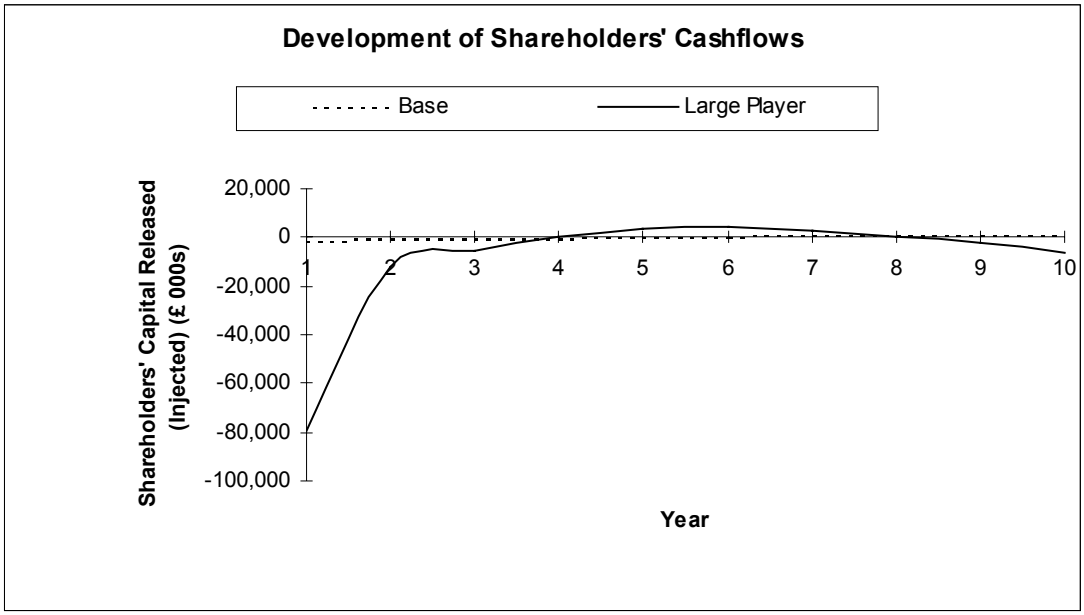
The expense ratios for the large player start at 30% and reduce to 25% from year 4 onwards. These expense ratios are smaller than the base scenario.

The combination of the loss ratios and expense ratios means large net outgoes initially as the shareholder's cashflows show.

Shareholders' Cashflows

Shareholders' Cashflows (£ 000s)

Scenario	Year									
	1	2	3	4	5	6	7	8	9	10
Base	-1,327	-871	-618	-348	-116	466	752	895	1,036	1,046
Large Player	-79,215	-12,056	-5,775	323	3,378	4,405	2,482	129	-1,923	-6,432

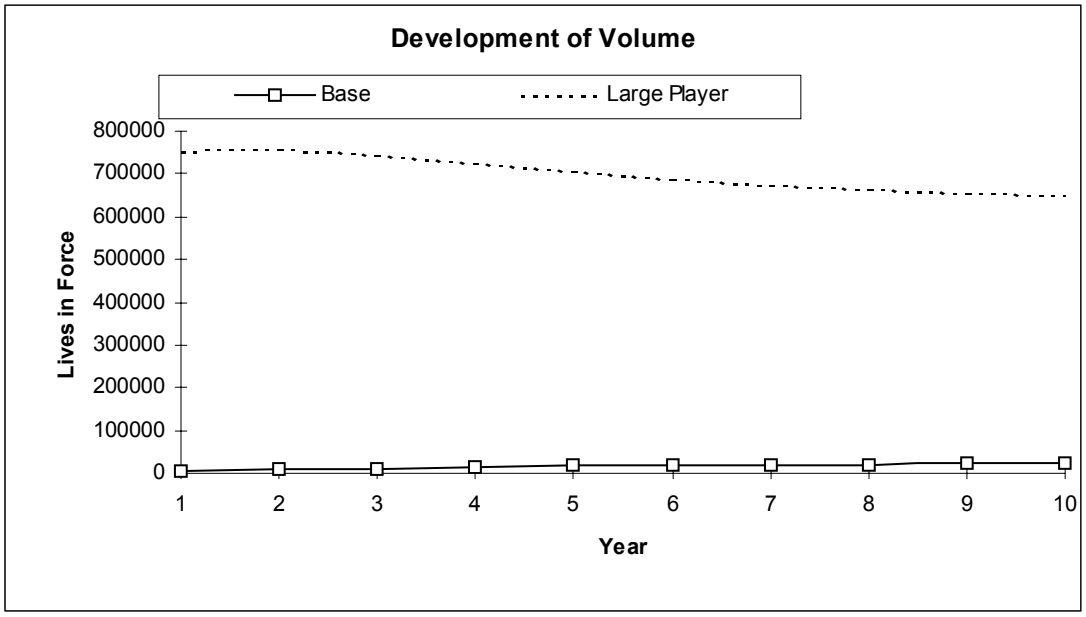


Business Volumes

The number of policies sold rises slightly and then falls at a steady rate of around 2% pa.

Total In Force (Lives)

Scenario	Year									
	1	2	3	4	5	6	7	8	9	10
Base	4,663	8,239	11,264	14,037	16,698	18,549	19,941	21,047	21,951	22,696
Large Player	751,965	756,671	744,197	725,453	705,735	688,025	673,534	662,351	654,410	649,248



Investments

We had initial investments of £500,000. The model was set up that so that all surplus monies would return to shareholders, limiting the assets to reserves and margins.

Effect of reduction in State cover

Description

This scenario looks at what happens if the State reduces the level or quality of care available, leading to an increase in dissatisfaction with the NHS and thus a greater propensity to take out private healthcare.

Changes Made to Model

We can model the effect of a reduction in State cover by using the NHS Dissatisfaction Index. Here it is not the absolute size of the index which is important but the relative change in its value from year to year. The base scenario has the index increasing by 5% per annum. This variable affects the following variables:

- Market new prospect rate
- Market exit rate,

with an increase in NHS dissatisfaction leading to more new prospects willing to take out PMI, and a lower exit rate as people realise that there is less cover available in the NHS than before.

To test the effect of this parameter the model was used with the index increasing at 10% p.a. to model an ongoing reduction in State cover.

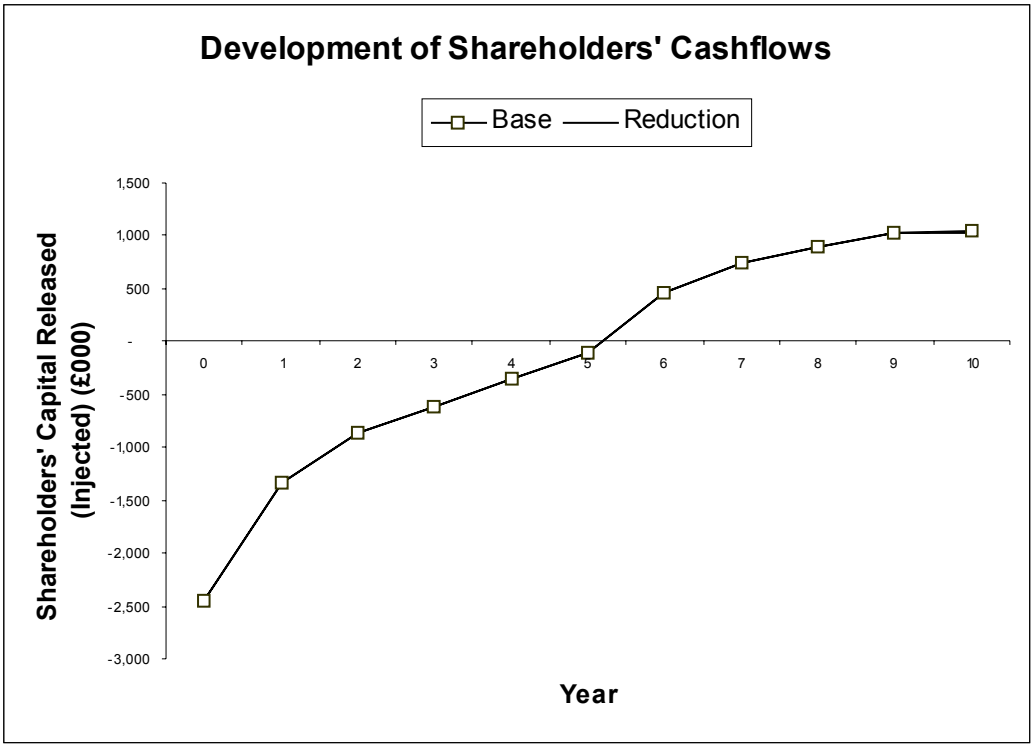
Results

Net Present Value of Shareholders' Cashflows

base	- £1,441,318
reduction	- £1,452,383

The result has worsened which seems counterintuitive. The reason for this is that the number of policies we sell is unchanged, but the claims costs increase as our hospital discount reduces (we have fewer policies compared with the market as a whole).

The reason that the number of policies we sell does not increase as one would expect is that the way that the formulae have been defined in the model means that the increase in market volume and the proportion of the market looking for a new insurer exactly offset the decrease in sales reach in the formula for the number of policies we sell. This is discussed in more detail in Appendix D.



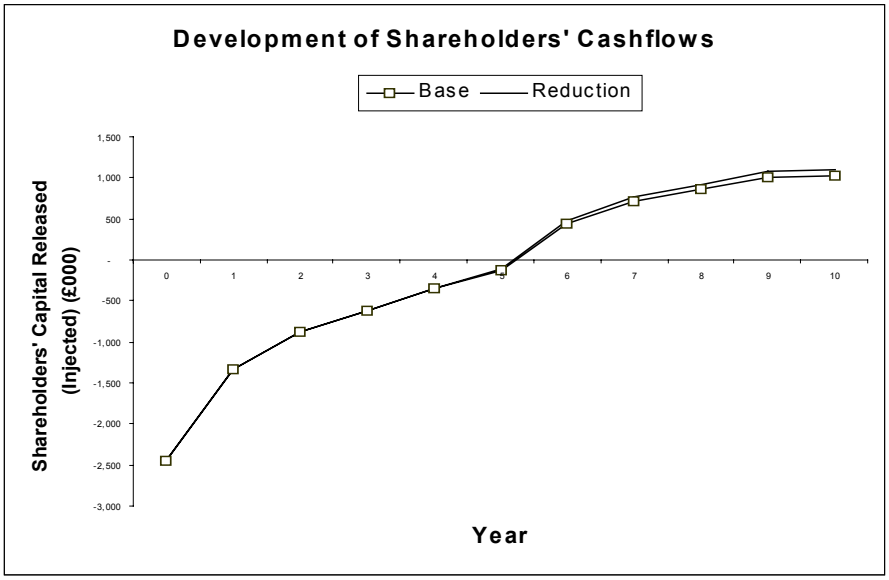
Change to model to counteract this effect

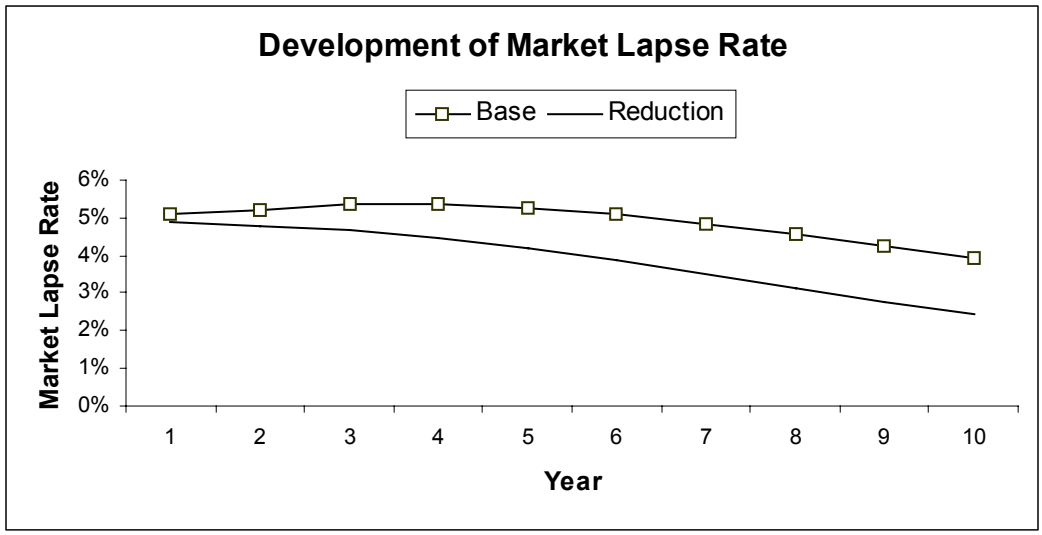
To bring in a more realistic correlation between a reduction in State cover and results, the formula for conversion ability was multiplied by the ratio of market volumes over the year, so that the number of policies sold increased in line with market volumes. The results after this change was made are given below.

Net Present Value of Shareholders' Cashflows

base	- £1,515,155
reduction	- £1,339,309

The result improves as expected.




Development of Market Lapse Rate
Base
Reduction
Market Lapse Rate
6%
5%
4%
3%
2%
1%
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2
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4
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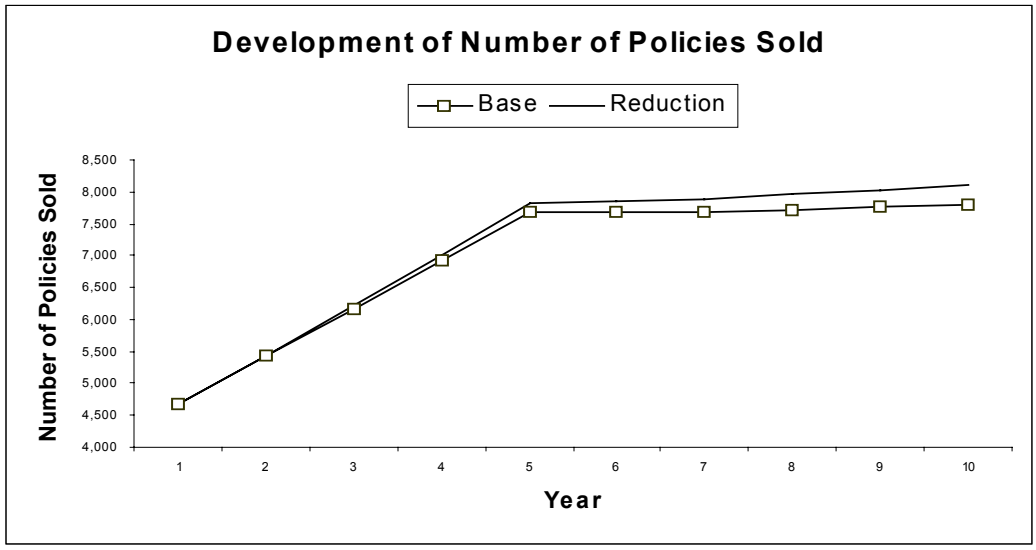
Year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Base
Reduction
Number of Policies Sold
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8,000
7,500
7,000
6,500
6,000
5,500
5,000
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2
3
4
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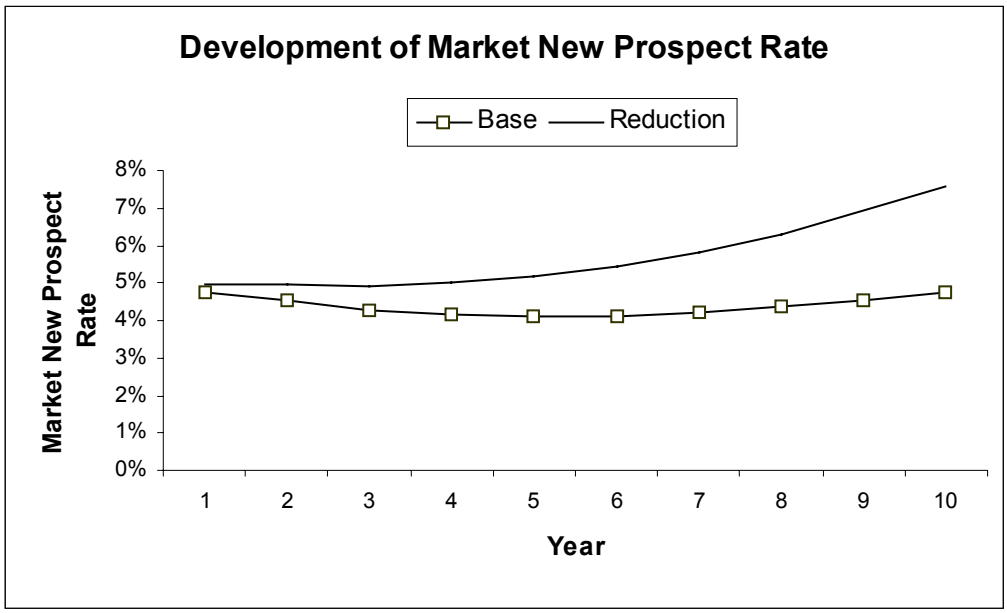
Year


Development of Market New Prospect Rate
Base
Reduction
Market New Prospect Rate
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7%
6%
5%
4%
3%
2%
1%
0%
1
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10
Year

Regulation

The main implications of the imposition of a new regulatory regime would probably relate to the way that sales are made. Sales-forces would require more training, there could be higher sales staff turnover, and other aspects of distribution, such as promotional literature and other materials, might become more expensive as the regulator imposes requirements for disclosure and policyholder education.

We have addressed some of these implications incrementally. The base model is adjusted to allow for one change, and the results recorded. Then the next change is made to this adjusted model and the results recorded and so on until we have a final model containing all the changes that we felt relevant. The steps that we have taken are as follow:

1. More training implies higher salesman costs and distribution network maintenance costs (for the market too).
2. Market rates might therefore increase (and loss ratios fall).
3. Salesman turnover rate increases.
4. Market number of salesmen falls.
5. Policy set-up costs increase (need to collect more information and ensure that policyholder is well informed).
6. Sales barriers increase.
7. Fewer sales per salesman.
8. Would commissions drop because of disclosure or increase because of the extra work for salesmen. Would they be flatter? This could be argued several ways. We could put up commissions just to compensate salesmen for the extra work imposed by the regulation. This should maintain the *status quo*. Alternatively, we could not put up commissions, and run the risk, either that we lose salesmen to players who do put up their commissions, or that they move to other markets entirely. This effect could be compounded by the fact that it is the better salesmen who are more likely to move.

For each of these changes, we consider the effect on the main aspects of the model's output. We have assumed that the new regulatory regime is imposed with effect from the beginning of the third year of our venture.

<u>Summary of Results</u>

In this section we shall compare key outputs, which demonstrate the effects that we are considering. We shall look at the following for each scenario and step:

- Total Lives in Force
- Loss Ratio
- Variable Expenses
- Semi-Variable Expenses
- Shareholders' Cashflows

Volumes

Total In Force (Lives)										
	Year									
Scenario/Step	1	2	3	4	5	6	7	8	9	10
Base	4663	8239	11264	14037	16698	18549	19941	21047	21951	22696
Higher Distribution Costs	4663	8239	11264	14037	16698	18549	19941	21047	21951	22696
Higher Rates	4663	8239	11264	14014	16666	18514	19906	21014	21920	22668
Higher Salesman Turnover	4663	8239	11264	14014	16666	18514	19906	21014	21920	22668
Fewer Salesmen	4663	8239	11264	14014	16666	18514	19906	21014	21920	22668
Higher Setup Costs	4663	8239	11264	14014	16666	18514	19906	21014	21920	22668
Higher Sales Barrier	4663	8239	10227	12227	14269	15704	16793	17667	18386	18983
Fewer Sales per Salesman	4663	8239	9364	10737	12272	13362	14199	14878	15442	15912
Lower Commission	4663	8239	9364	10918	12535	13657	14501	15173	15721	16171
Higher Commission	4663	8239	9364	11009	12671	13816	14672	15346	15892	16335
Flatter Commission	4663	8239	9364	11100	12811	13985	14856	15539	16086	16527

Higher distribution costs alone have no impact on volumes. When the market puts up its rates, however, there is a small impact as the size of the market contracts in reaction to the higher market prices. This is simple supply and demand in action. Higher salesman turnover has no effect because we have assumed that the insurer will act to maintain a constant level and quality of salesmen, whatever the turnover rate. The direct impact is therefore on costs. We can make the same sales with fewer salesmen because the total number of salesmen in the market has fallen proportionately. Higher set-up costs impact directly only on our costs. The higher sales barrier makes each sale more difficult, so volumes drop, and the reduced number of sales per salesman also has a big impact, as it becomes more difficult and time-consuming for a salesman to make a sale. (Bear in mind that these effects would in reality all come together, so apparently anomalous effects can appear if we consider one in isolation.)

We have tested three commission scenarios. If commissions (ours and the market's) drop as a result of the regulation, we see a slight increase in sales because our commissions were lower anyway, so the impact on our salesmen is less marked. If commissions increase, we see an increase in sales as the market grows because salesmen have more incentive to develop the market. If we flatten commissions, and the market does too, we see higher volumes yet again. However, we are seeing fairly trivial net effects in the context of the other impacts that we are investigating. We have considered the way that the model treats commission in Appendix D.

Loss Ratio

Incurred Claims/Earned Premiums										
	Year									
Scenario/Step	1	2	3	4	5	6	7	8	9	10
Base	44%	52%	56%	59%	61%	63%	64%	66%	66%	67%
Higher Distribution Costs	44%	52%	56%	59%	61%	63%	64%	66%	66%	67%
Higher Rates	44%	52%	55%	56%	58%	60%	61%	62%	63%	64%
Higher Salesman Turnover	44%	52%	55%	56%	58%	60%	61%	62%	63%	64%
Fewer Salesmen	44%	52%	55%	56%	58%	60%	61%	62%	63%	64%
Higher Setup Costs	44%	52%	55%	56%	58%	60%	61%	62%	63%	64%
Higher Sales Barrier	44%	52%	56%	57%	59%	61%	62%	63%	63%	64%
Fewer Sales per Salesman	44%	52%	56%	58%	60%	61%	62%	63%	63%	64%
Lower Commission	44%	52%	56%	58%	60%	61%	63%	63%	64%	64%
Higher Commission	44%	52%	56%	58%	60%	62%	63%	64%	64%	65%
Flatter Commission	44%	52%	56%	58%	60%	62%	63%	64%	64%	65%

Changes in the loss ratio are driven by the changes in claim frequency and changes we make to our office premiums. The loss ratio drops (all other things being equal) if we increase our rates. It then creeps up, first as we put up the sales barrier, and then as we reduce the number of sale per salesman.

Variable Expenses

Variable Expenses (£)										
	Year									
Scenario/Step	1	2	3	4	5	6	7	8	9	10
Base	550,487	1,041,927	1,546,112	2,073,431	2,624,432	3,056,811	3,401,817	3,691,418	3,931,628	4,151,538
Higher Distribution Costs	550,487	1,041,927	1,546,112	2,073,431	2,624,432	3,056,811	3,401,817	3,691,418	3,931,628	4,151,538
Higher Rates	550,487	1,041,927	1,595,915	2,141,299	2,709,983	3,156,379	3,512,698	3,811,845	4,059,837	4,286,914
Higher Salesman Turnover	550,487	1,041,927	1,595,915	2,141,299	2,709,983	3,156,379	3,512,698	3,811,845	4,059,837	4,286,914
Fewer Salesmen	550,487	1,041,927	1,595,915	2,141,299	2,709,983	3,156,379	3,512,698	3,811,845	4,059,837	4,286,914
Higher Setup Costs	550,487	1,041,927	1,715,411	2,294,439	2,897,560	3,371,006	3,750,384	4,070,291	4,337,514	4,582,682
Higher Sales Barrier	550,487	1,041,927	1,552,266	1,998,223	2,478,104	2,857,286	3,162,423	3,420,907	3,637,438	3,837,067
Fewer Sales per Salesman	550,487	1,041,927	1,416,311	1,751,376	2,128,555	2,429,180	2,672,446	2,879,741	3,054,025	3,215,701
Lower Commission	550,487	1,041,927	1,100,379	1,369,834	1,665,260	1,895,925	2,081,903	2,239,740	2,373,215	2,496,305
Higher Commission	550,487	1,041,927	1,630,099	2,059,794	2,523,797	2,878,155	3,158,558	3,392,617	3,584,616	3,760,749
Flatter Commission	550,487	1,041,927	1,270,619	1,619,367	1,994,545	2,302,152	2,547,120	2,752,013	2,921,676	3,075,869

Variable expenses include a proportion of total premiums, an amount per policy written, an amount per policy in force, and an amount per claim made. Overall, then, they are very much volume-driven (by definition), and this is apparent from the table above. Distribution costs are regarded as fixed, so as we increase these there is no effect on variable expenses. As we increase the rates, per-premium expenses increase as well, while a higher turnover of salesmen and fewer salesmen have no effect on direct variable expenses. Higher set-up costs increase our expenses, while the reduced volumes after the sales barrier is lifted bring the expenses back down. The effects of different commissions are intuitive: lower commissions reduce variable costs, higher commissions increase them, and the flatter commission scenario sits somewhere in-between.

Semi-Variable Expenses

Semi-Variable Expenses (£)										
	Year									
Scenario/Step	1	2	3	4	5	6	7	8	9	10
Base	959,750	1,110,546	1,269,526	1,437,045	1,613,473	1,500,680	1,545,701	1,592,072	1,639,834	1,689,029
Higher Distribution Costs	959,750	1,110,546	1,521,309	1,722,269	1,933,917	1,798,498	1,852,453	1,908,026	1,965,267	2,024,225
Higher Rates	959,750	1,110,546	1,521,309	1,722,269	1,933,917	1,798,498	1,852,453	1,908,026	1,965,267	2,024,225
Higher Salesman Turnover	959,750	1,110,546	1,521,309	1,762,787	1,975,651	1,841,484	1,896,728	1,953,630	2,012,239	2,072,606
Fewer Salesmen	959,750	1,110,546	1,737,669	1,762,787	1,975,651	1,841,484	1,896,728	1,953,630	2,012,239	2,072,606
Higher Setup Costs	959,750	1,110,546	1,737,669	1,762,787	1,975,651	1,841,484	1,896,728	1,953,630	2,012,239	2,072,606
Higher Sales Barrier	959,750	1,110,546	1,737,669	1,762,787	1,975,651	1,841,484	1,896,728	1,953,630	2,012,239	2,072,606
Fewer Sales per Salesman	959,750	1,110,546	1,737,669	1,762,787	1,975,651	1,841,484	1,896,728	1,953,630	2,012,239	2,072,606
Lower Commission	959,750	1,110,546	1,678,662	1,762,787	1,975,651	1,841,484	1,896,728	1,953,630	2,012,239	2,072,606
Higher Commission	959,750	1,110,546	1,678,662	1,762,787	1,975,651	1,841,484	1,896,728	1,953,630	2,012,239	2,072,606
Flatter Commission	959,750	1,110,546	1,521,309	1,762,787	1,975,651	1,841,484	1,896,728	1,953,630	2,012,239	2,072,606

We regard our distribution costs and the costs of recruiting, training and remunerating salesmen (apart from commission) as semi-variable. To illustrate the effect of higher distribution costs and higher salesman turnover, we have compared the semi-variable costs for our scenarios in the table above. As some salesmen leave the market in the year in which Regulation is introduced, our costs are affected by the extra money we need to spend to attract our desired number of salesmen. This is a direct result of extra leakage of salesmen from our salesforce in that year as there is a one-off exodus. In subsequent years, our turnover is stabilised, and the reduced market sales-force is reflected in the extra cost of maintaining our own sales team.

Shareholders' Cashflows

Shareholders' Cashflows (£)										
	Year									
Scenario/Step	1	2	3	4	5	6	7	8	9	10
Base	-1,326,958	-870,665	-617,670	-347,873	-115,619	465,640	751,808	895,340	1,036,206	1,045,635
Higher Distribution Costs	-1,326,958	-870,665	-877,241	-641,918	-445,973	158,612	435,569	569,613	700,708	700,072
Higher Rates	-1,326,958	-870,665	-802,061	-275,449	34,578	762,100	1,137,536	1,349,886	1,545,063	1,597,292
Higher Salesman Turnover	-1,326,958	-870,665	-802,061	-317,220	-8,447	717,785	1,091,891	1,302,872	1,496,638	1,547,415
Fewer Salesmen	-1,326,958	-870,665	-1,025,113	-317,220	-8,447	717,785	1,091,891	1,302,872	1,496,638	1,547,415
Higher Setup Costs	-1,326,958	-870,665	-1,148,304	-475,096	-201,825	496,519	846,853	1,036,433	1,210,373	1,242,499
Higher Sales Barrier	-1,326,958	-870,665	-1,075,926	-631,100	-474,774	104,857	375,836	516,419	647,455	659,714
Fewer Sales per Salesman	-1,326,958	-870,665	-1,014,669	-760,381	-702,277	-220,951	-15,771	84,350	180,001	176,078
Lower Commission	-1,326,958	-870,665	-669,358	-408,140	-233,529	344,375	625,242	784,924	930,241	966,695
Higher Commission	-1,326,958	-870,665	-1,146,340	-1,043,754	-1,025,261	-590,970	-423,030	-352,732	-277,850	-301,108
Flatter Commission	-1,326,958	-870,665	-660,430	-639,104	-511,723	-4,865	217,422	328,769	436,640	439,931

Finally, we see the way that all these effects feed into our overall results. Higher distribution costs will reduce our profitability, while an increase in our rates can more than off-set this (all other things being equal). As turnover of salesmen increases, we need to spend more on recruiting and training new ones, so our profitability is pulled down marginally. Some salesmen leave the market in the year in which Regulation is introduced, and this has a one-off impact on our profitability. As policy set-up costs increase, and it becomes more difficult to make a sale, we see profits pulled down even further. We can only recover this profitability if we reduce commissions; to an extent this serves to off-set the increase in other costs associated with maintaining a sales-force. If we increase commissions, we remove nearly all chance of making a profit, while a flatter commission structure will eventually bring us to profitability, but far more slowly than in the absence of Regulation.

Perhaps there is a lesson to be learned here: while the policyholder ends up paying more premium, and the insurer makes less profit, the only people who seem to gain from a higher compliance overhead are those salesmen who remain in the market and the compliance department of the insurer.

Aggressive Initial Pricing to follow the Durational Effect

Description of Scenario

In order to generate quick volume or as a strategy to match the price to claims by duration, the company might offer a heavily discounted initial price. This price is then increased sharply over the following years in order to reflect underwriting wearing off and also to generate profits on the portfolio.

The company might hope to retain members for long enough in order to make a profit (having made a loss in the early years primarily due to expenses not being covered). Alternatively, the company might seek to make a small profit on a large portfolio and expect many of the policyholders to lapse as the price rises.

Changes Made to Model

This scenario requires only a very simple parameter change in the model. The price adjuster figures are changed on the input screen. The adjustments apply to each calendar year but are different by duration for each of the three options.

		Duration									
		1	2	3	4	5	6	7	8	9	10
Base		1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Option 1		1.1	1.2	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Option 2		0.8	1.0	1.2	1.4	1.6	1.6	1.6	1.6	1.6	1.6
Option 3		1.15	1.20	1.25	1.30	1.35	1.40	1.45	1.50	1.55	1.60

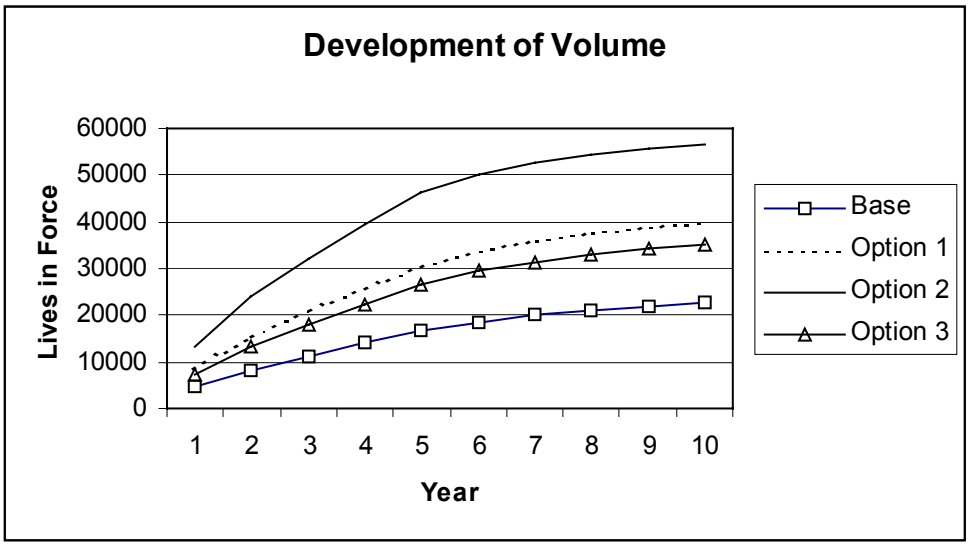
Results

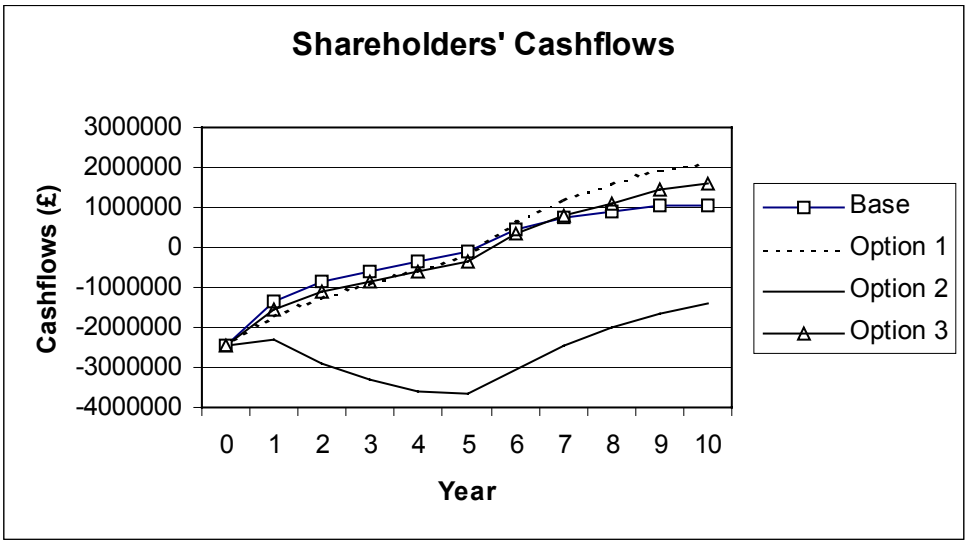
All three options result in a larger portfolio of business for our company. Shareholders' cashflows and the net present value of these differ quite substantially between the scenarios.

	NPV of Cashflows
Base	-£1,441,317
Option 1	+£34,743
Option 2	-£14,981,250
Option 3	-£1,076,043

The table and the following graphs show that the incentive of cheaper prices initially does generate extra volume but this has to be treated with care. If the prices are not increased quickly enough then a loss is made (option 3). However, if the prices are increased too quickly the policyholders all lapse before a profit can be made (option 2). However, if the balance is struck, extra policyholders can be recruited for

sufficient time to make a profit overall and the fixed costs are spread over sufficient policyholders to make it a better option than the base scenario.





Comments

There appears to be some good justification to follow this strategy in a moderate manner.

APPENDIX A: A MODEL FOR BUSINESS PLANNING

Introduction

These appendices repeat and amend slightly a section of last year's paper, describing the model itself, and the ways that the sub-group envisaged using the model last year. The appendices are included in this year's paper to allow the reader to follow this year's work without the need to refer to last year's paper.

The description of the model itself includes detail on the formulae and parameters that make up the model. However, we have attempted to accompany this with as much of our reasoning as possible. The intention is that the reader can understand (and argue with) our reasoning without spending much time analysing the formulae themselves. The model and its parameters as they stood last year have been scrutinised by members of the current sub-group who were not involved in the model's development. Insofar as the assumptions within the model can be judged reasonable, therefore, we believe its output also to be reasonable. We hope to publish the model in electronic form, so that interested readers will have the chance to consider it themselves.

Stage I: Description of Core Model

We saw ourselves at the outset as a green-field operation, looking to enter the UK Private Medical Insurance (PMI) market in the circumstances faced by that market today. Two separate extremes of the market have been identified as interesting: the Individual market and the Group market. Initially we consider one of these, Individual, where we assume that information is less freely available and that products may be differentiated.

Business volume projections should be driven by a combination of market size (driven by external factors) and market share (driven by internal factors). At the outset, premiums will be driven by market average rates for the range of products considered (e.g. beginning with an In-patient only product). Claim cost assumptions will be driven by assumptions about market loss ratios. If we wish to introduce variability by rating factors, we can assume initially that the market is not cross-subsidising rates, so that claim cost assumptions vary as rates. We may also allow for the possibility that we have a prior assumption of a suitable rating structure (e.g. a selection effect from underwriting).

Expense assumptions can be developed using internal estimates of the costs of different activities, as well as an allowance for overhead expenses. Capital allocation should be driven by assumptions about statutory requirements as well as internal requirements for working capital. The business has comparatively low variance so that we can assume that there is no need to hold solvency capital in excess of the statutory requirement.

These components can be used to derive projections of financial statements for the business, using a series of deterministic scenarios. The chosen combination of time-step and projection period was annual for ten years.

Stage II: Variations on a Theme

Once the core model has been developed, we can use it as a central basis for further investigation, building in complexity in stages as we understand each new stage. Examples of these complexities might include:

- extending to new products (e.g. In-patient and Out-patient);
- extending to new markets (e.g. Group);
- different entry strategies (use of external parties such as reinsurers, third party administrators (TPAs) and consultants, will affect the amount and timing of capital flows);
- new slants on the market may have a similar effect (e.g. capital costs of developing sophisticated underwriting or negotiating hospital discounts against longer-term cost savings);
- simulating the effect of breaking into a new target market, so that growth of our market comes from a new source, rather than pushing ourselves into the existing market;
- allowing for irrational behaviour (do we necessarily expect to break even economically?);
- building in more external factors, such as State cost-shifting, taxation/tax relief, and the real cost of healthcare compared with economic growth.

Most of these complexities should be achieved by changing or adding to the key parameters in the core model – to a limited extent this has been built into the model as it stands.

APPENDIX B: SPECIFICATION OF BUSINESS MODEL

Introduction

This appendix lays out a mathematical specification for the Core Model, as described in the outline above. The specification is in tabular form, describing the key parameters that will be summarised to produce financial projections for the business being modelled. Readers of last year's paper will note some small changes in this specification (and, indeed, in the model itself). These result from the scrutiny that has been applied to the model, and corrections of anomalies that we found as we used the model to test scenarios.

The tables are separated into the following units:

- inputs;
- marginal effect of income and claims for one cohort of business;
- marginal expenses;
- capital expenditure;
- on-going overhead costs.

Each table contains four columns, headed:

- Parameter (the name of the parameter).
- Description (of what the parameter represents).
- Function (the parameter expressed as a function of others).
- Comment or reference to subsequent note.

The underlying assumption is that the model will consider annual time-slices. This means that each cohort represents new business written in one calendar year (n). Experience is projected for the first and subsequent policy years (d). Calendar year (n= 0) represents the year prior to launch, into which all up-front investment is assumed to be compressed. Policy year (d=0) represents the inception year of a cohort of business.

No allowance is made for rating factors such as age and gender, or for differences in product mix. The model, once established, can be extended or adapted to allow for this.

For clarity, parameters which represent numbers or amounts are given names in capital letters, with subscripts which should be self-explanatory. Parameters which represent proportions or adjustment factors are on the whole represented using the Greek alphabet.

Main Input Parameters			
Parameter	**Description**	**Formula**	**Comment**
$\alpha_{n,d}$	Price Adjuster	Input	1
si_{n-1}	Severity Inflation Index	Input	
fi_{n-1}	Frequency Inflation Index	Input	
$C_{n,0}$	Initial Commission	Input	%age of Premium
MIC_n	Market Initial Commission	Input	%age of Premium
AS_n	Annual Advertising Spend	Input	£Amount
NHS_n	Index of NHS Dissatisfaction	Input	2
MAS_n	Market Advertising Spend	Input	3
$prop_n$	Proportion of market already customers	Input	4
B_n	Brand Strength Index	Input	5
Uw_n	Underwriting/Sales Barrier Index	Input depends on complexity of underwriting and/or product	6
ψ	Ratio of claim frequency to claim probability	Input	7
ρ_n	Market Loss Ratio	Input	
γ_n	Market Hospital Discount	Input	
τ	Basic Salesman Turnover rate	Input	
NS_n	Number of Salesmen	Input	9

Marginal Effect of a Single Cohort (Initial)

Parameter	Description	Formula	Comment
$N_{n,0}$	Number of policies sold	$= M_n \times \sigma_n \times \lambda_{n,d} \times SR_n$	10
MR_n	Market Retail Price	$=MR_{n-1}\times(1+si_{n-1})\times(1+fi_{n-1})$ (MR_0 Input)	
$R_{n,d}$	Retail Price	$=MR_n\times\alpha_{n,d}$	
M_n	Market Volume	Used to benchmark net new entrants	11
σ_n	Proportion of market looking for a new insurer	$= \beta_{N-1,old} + \beta_{N-1,new}$	Captures new prospects as well as the renewal market.
$\beta_{n,old}$	Market Switch Rate	$= \beta_{n-1,old} * \left\{ a\left(\frac{MAS_n + AS_n}{MAS_{n-1} + AS_{n-1}}\right) \cdot \left(\frac{1}{1+\inf}\right) + (1-a)\left(\frac{MIC_n * MRC_{n-1}}{MIC_{n-1} * MRC_n}\right)\right\} * \left(\frac{MR_n}{MR_{n-1}} * \left(\frac{1}{1+\inf}\right)\right)^c$	12
$\beta_{n,new}$	Market New Prospect Rate	$= \beta_{n-1,new} * \left\{ a\left(\frac{MAS_n + AS_n}{MAS_{n-1} + AS_{n-1}}\right) \cdot \left(\frac{1}{1+\inf}\right) + (1-a)\left(\frac{MIC_n * MRC_{n-1}}{MIC_{n-1} * MRC_n}\right)\right\} * \left(\frac{NHS_n}{NHS_{n-1}}\right)^b * \left(\frac{MR_{n-1}}{MR_n} * (1+\inf)\right)^c$	13
η_n	Market Exit Rate	$= \eta_{n-1,new} * \left\{ a\left(\frac{MAS_n + AS_n}{MAS_{n-1} + AS_{n-1}}\right) \cdot \left(\frac{1}{1+\inf}\right) + (1-a)\left(\frac{MIC_n * MRC_{n-1}}{MIC_{n-1} * MRC_n}\right)\right\} * \left(\frac{NHS_{n-1}}{NHS_n}\right)^b * \left(\frac{MR_n}{MR_{n-1}} * \left(\frac{1}{1+\inf}\right)\right)^c$	14
$\lambda_{n.d}$	Conversion Ability	$\left(1+\frac{\left(MR_n - R_{n,0}\right)}{MR_n}\right)^2 \Big/ \left\{\left(1+\frac{\lvert MR_n - R_{n,0}\rvert}{R_{n,0}}\right) \times UW_n\right\}$	15
SR_n	Sales Reach	$\frac{NS_n * SPS_{n-1}}{M_{n-1} * \sigma_{n-1}} * \left(1+\sqrt{AS_n/(MAS_n + AS_n)}\right) * \left(1+B_n * prop_n\right)$	16
NSR_n	Number of Salesmen staying on from last year	$\frac{NS_{n-1}}{} * \frac{MNS_n}{MNS_{n-1}} * \left\{ d\left(\frac{C_{n,0} * MIC_{n-1}}{C_{n-1,0} * MIC_n}\right) + (1-d)\left(\frac{STC_n * MSTC_{n-1}}{STC_{n-1} * MSTC_n}\right)\right\} * \left(\frac{DIST_n * MDIST_{n-1}}{DIST_{n-1} * MDIST_n}\right)^e * (1-\tau)$	17
a	Advertising Spend Effect Weight	Constant, between 0 and 1	

Marginal Effect of a Single Cohort (Renewal)				
Parameter	**Description**	**Formula**	**Comment**	
$N_{n,d}$	Number of policies renewing	$= N_{n-1,d-1} \times \pi_{n-1,d-1} \times \delta_{n-1,d-1}$		18
$\pi_{n,d}$	Basic Persistency Rate	$\frac{(1-\pi_{n,d})}{(1-\pi_{n-1,d})} = \left\{ a\left(\frac{MAS_n + AS_n}{MAS_{n-1} + AS_{n-1}}\right) \cdot \left(\frac{1}{1+\inf}\right) + (1-a)\left(\frac{MIC_n * MRC_{n-1}}{MRC * MIC_{n-1}}\right) \right\} * \left(\frac{R_{n,d}}{R_{n-1,d-1}} \left(\frac{f}{1+\inf} + (1-f)\frac{MR_{n-1}}{MR_n} \right) \right)^c$		19
$\delta_{n,d}$	Persistency Scaling Factor	$= \delta_{n,claimed} \times Z_{n,d} + \delta_{n,notclaimed} \times (1 - Z_{n,d})$		20
$\zeta_{n,d}$	Claim Scaling Factor	$= \zeta_{n,claimed} \times Z_{n,d} + \zeta_{n,notclaimed} \times (1 - Z_{n,d})$		8
$Z_{n,d}$	Probability of having claimed in the past two years, by duration d	$= 1 - \prod_{k=\max(0,d-3)}^{d-1} (1 - \Psi_{n-d+k,k,uw})$		21
$\Psi_{n,d,uw}$	Probability of claiming in one year	$=\Phi_{n,d,uw}/\psi$		
b	NHS dissatisfaction weight parameter	constant, of the order of 1		
$\Phi_{n,d,uw}$	Claim Frequency	$=MF_n.\zeta_{n,d}$	Function of U/W used	
c	Market Price Elasticity weight parameter	constant, of the order of 1		
MF_n	Market Claim Frequency	$=MR_n.\rho_n/MS_n$	Assume Ave Duration	
d	Commission Effect Weight for salesman retention	Constant, between 0 and 1		
MS_n	Market Average Claim Cost	$=Ms_{n-1}\times(1+si_{n-1})$ (MS_0 Input)		
Γ_n	Our Average Claim Cost	$=MS_n \div (1-\gamma_n) \times (1-\varepsilon_n)$	22	
e	Distribution effort weight parameter	constant, of the order of 1		
ε_n	Our Hospital Discount	$= \gamma_n \left(\frac{TotalClaimsIncurred}{M_n.MF_n} \right)^{50000/HN_n}$	23	

Initial Marginal Expenses for a Single Cohort			
Parameter	**Description**	**Formula**	**Comment**
$C_{n,0}$	Inital Commission	Input	%age of premium
UWC_n	Underwriting Cost	Input	£ per unit
Su_n	Policy Set-Up Cost	Input	£ per unit
Renewal Marginal Expenses for a Single Cohort			
Parameter	**Description**	**Formula**	**Comment**
CHC_n	Claims Handling Cost	Input	£ per unit
CHP_n	Claims Handling Cost	Input	%age of premium
PAC_n	Policy Administration Cost	Input	£ per unit
PAP_n	Policy Administration Cost	Input	%age of premium
$C_{n,d}$	Renewal Commission	Input	%age of premium
Capital Investment Prior to Launch and On-Going Overheads			
Parameter	**Description**	**Formula**	**Comment**
STC_n	Cost to pay and train one salesman	Input	24
$MSTC_n$	Market Cost to pay and train one salesman	Input	
SRC	Cost of Recruiting one salesman	Input	
MNS_n	Total Market Number of Salesmen	Input	
SPS_n	Annual Sales per Salesman	Input	
ASC_n	Administration Systems Costs	Input	
HN_n	Annual Hospital Negotiation Expenditure	Input	
MKT_n	Marketing Expenditure	Input	
CAP_n	Other Capital Assets	Input	
$DIST_n$	Cost of maintaining distribution network	Input	
$MDIST_n$	Market expenditure on distribution network	Input	
TPM_n	Margins to Third Parties	Formula based on Revenue/Profits, &c.	25

Notes

1. The price adjuster allows us to test different pricing strategies against the market. For each calendar year and for each policy year we can aim to undercut the market or deliberately set our prices higher. For example, we may wish to take a loss leader for the first few calendar years. Alternatively, we may wish to set durational prices that reflect the select effect of underwriting in the early policy years, and selective lapsing in the latter stages of a policy's lifetime.

2. This is intended to represent individuals' attitudes towards private healthcare as opposed to State provision. We have called it a 'NHS dissatisfaction index', but it covers many complex issues, such as the quality of NHS provision, the cost and quality of private provision, general wealth and spending choices, as well as the level of taxation allocated to the NHS.

3. This controls two main variables. First, the more advertising, the more switching activity is likely to take place (which may be to the benefit of a new entrant). Second, the more the market advertises relative to us, the less we are likely to benefit from this activity.

4. Our strategy may involve targeting a market which intersects with our own customer base. For example, a large retail bank may wish to exploit the information it already has about its own customers, whether these are typical PMI buyers, or we are trying to break into a virgin market. The higher the proportion of our target market already in our customer-base, the better we should expect our results to be.

5. The impact of having a target market intersecting with our customer base must be driven by the strength of our brand. This brand may be relevant to PMI (for example if we are an existing PMI insurer considering staying in the market), or not, but important anyway (for example the trust that a retail bank's customers may have for the bank generally). This parameter takes a value between 0 and 1.

6. However good our advertising, and access to potential new customers, we will find products more difficult to sell if the application process is too complex. Complexities could come from explaining a complicated product to the customer, or from the paperwork and effort involved with a more rigorous underwriting approach. This is one example of the cost-benefit relationships that are fundamental to our modelling philosophy. The more complex our underwriting, the better we should expect our claims experience to be, but the harder it will be to sell a policy. Of course, more complex underwriting also costs more to perform. This parameter takes a value between 0 and 1.

7. We believe that lapse probability is strongly correlated with past claims experience. We express this as having two lapse parameters – one for those who have claimed, and one for those who have not. We therefore need to calculate for each renewal the proportion of policies that have claimed prior to that renewal. This is driven by the probability of claiming each year. Since the rest of the model is driven by claim frequency (i.e. the expected *number* of claims per policy in a

given year), we need some conversion factor to reflect the fact that some policies can claim more than once.

8. We expect that the select effect of underwriting is more evident in the relationship between claim frequency and duration than in the severity/duration relationship. We have therefore built in a set of frequency relativities, so that we can estimate the likely frequency each policy year, compared with the market average. Depending on the underwriting approach we use, we would tend to expect lower frequencies initially, and probably higher frequencies than average later on in a policy's lifetime. However, it is conceivable that very rigorous underwriting could give an ultimate claim frequency that is similar to, or even below, the market average.

In fact, we believe that there is a relationship between claim frequency in a policy year and the persistency rate in that year, and that these are both closely linked to the proportion of the membership at that policy year that is still to claim. In the same way that policies that have claimed recently are less likely to lapse, they are more likely to claim again. The model therefore simulates the increasing claim frequency and the decreasing lapse propensity of a cohort of business as it ages, by assuming a different rate of claim and lapse, depending on historical claim frequency. As the cohort ages, the proportion of policies that have claimed increases; if we assume that these policies show both higher claim frequency and lapse propensity, the model reproduces observed durational effects in claims and persistency.

9. This is something that in a real situation we would expect to control. However, our ability to recruit and retain salesmen is not entirely within our control. The model sets the number of salesmen as an input, and then calculates how many need to be recruited each year, given a basic turnover rate, and the effect of our incentive strategy.

10. The number of new policies that we sell each year depends on the number of potential sales (market size multiplied by the proportion looking for a new insurer), our ability to reach these potential customers, and our ability to convert those that we do reach.

11. The total market size can be regarded as a reasonableness check. Although it is not actually an input, it is driven by several fairly esoteric parameters. By keeping the modelled market size within a reasonable range, we can be fairly confident that these parameters are also behaving sensibly.

12. This function (β_{old}) is the proportion of last year's market which is looking around for a new quotation. It is a function of last year's value, our own and the rest of the market's advertising spend, the balance between initial and renewal commission, and the market's rate reviews. As the market shifts its emphasis towards renewal, rather than initial commission, persistency should improve as less churning takes place. We can improve this (from our point of view) marginally by advertising more. Of course, as the market's rates increase (in real terms at least), we should expect persistency to deteriorate.

13. This function (β_{new}) is the proportion of last year's market represented by new customers looking around for a quotation. It works in exactly the same way as (β_{old}), except that we use a 'NHS dissatisfaction' index, which measures the population's relative disposal towards private provision. The NHS dissatisfaction index is one of the parameters that we can benchmark against the expected total market size each year.

The additional parameters in the formulae {β} are "effect weights". We can weight the relative importance of advertising and commission. We can also change the extent to which changes in price affect {β}.

14. This function is the proportion of last year's market represented by existing customers who drop out of the market. It works in a similar way to (β_{new}), except that increased NHS dissatisfaction and smaller price increases are likely to reduce the market exit rate, while they would increase the new entrant rate. This function also contains effect weights.

15. This comes down to the question:

    "Once we have a prospect in front of a salesman, how attractive is our offering compared with that of the market?"

    To answer this, we have two considerations: price elasticity and complexity. Price elasticity has two components. The first of these measures how credible our rate is; the closer our rate is to the market (in either direction), the more credible. The second measures perceived value for money; the more expensive our product, the less attractive it is. The result is a peak attractiveness at a price just below the market: too low and we lose credibility; too high, and we might as well not bother.

    The other aspect of conversion ability is the attractiveness of the product itself. This is a very judgmental consideration, dependent on features such as the complexity of the underwriting, the understandability of the product, and the relative benefit structure. This is therefore left as a single parameter, such that the more complex, the higher that value of the parameter, and the less attractive the product appears.

16. This measures our access to the potential market. It depends on the number and quality of our salesmen (or proxy, such as branches), the relative amount we spend on advertising compared with the market, our brand strength, and the proportion of the market to which we already have direct access, by virtue of our core business (e.g. personal banking). We take Average Sales Per Salesman and Total Market Sales from last year, to avoid circular arguments. With no effort at all, we assume that we have access to that proportion of the market represented by average sales per salesman multiplied by number of salesmen, divided by total market sales. We can improve on this position (marginally) by advertising more, or if we have a strong brand image amongst a section of the market. However, even a very strong brand in a large proportion of the market will not guarantee access to everybody.

17. We can improve our retention of salesmen from last year (as a proportion of the market's salesmen) by paying relatively more commission, spending more on salaries and training, or by offering them better sales support via a distribution network. This proportion is fairly linear with the relative effort we spend on any of these incentives, but we have allowed for effect weights, so that the relative importance of different influences can be adjusted. All these factors adjust a basic salesman lapse rate.

18. The number of policies renewing is a function of last year's in-force, a basic lapse rate, and an adjuster which reflects the tendency of persistency to improve with duration.

19. Let us consider how these renewal rates will compare with the market's. First, the influence of advertising and churning will be fairly similar. Second, it is our prices, rather than the market's, which will be the key driver. We can set a basic lapse rate based on these considerations which expresses the general tendency to renew. The market's rate change will have a slight modifying effect on the way our lapse rate depends on our rate changes.

20. We should recognise that persistency is selective. If we break renewals into cohorts by duration, we end up with a composite lapse rate made up of separate lapse rates for those who have claimed (lower because the market will re-underwrite) and those who have not (higher because price is probably the only consideration). As duration increases, the balance shifts from the latter to the former, and so persistency (and average morbidity) increase. We can then increase the basic persistency rate for claimants, and reduce it for non-claimants, to reflect selectivity. The resultant exposure should tie in with our expected durational claim frequency factors.

21. This is a simple probabilistic calculation. The probability of not having claimed in the past two policy years is approximated by the product of the individual probabilities of not claiming in each of the previous two policy years.

22. We believe that the market (represented largely by a few dominant players) is able to negotiate fairly substantial 'discounts' on provider charges. This could be purely volume-driven, but may also be a function of closer relationships between these insurers and many providers. Our average claim cost is therefore likely to be higher, unless we can achieve the same 'discounts'. To derive our average claim cost, we reverse out the market discount, and then apply our estimate of the discount that we expect to negotiate.

23. We express the discount that we expect to achieve as a function of the market's discount, and the volume of claims that we expect that year compared with the volume of claims that the market expects that year. If we can offer a higher through-put, we are likely to benefit from volume-related discounts. We have modified this function to allow for the fact that we may be able to improve discounts by spending more on negotiation with hospitals. In the extreme, we could spend nothing, and have no way of letting providers know that we will be sending them lots of patients. The more we spend, the more able we should be to negotiate discounts with more providers.

24. We may not actually have any salesmen. However, for the model to work, we need to have some proxy for whatever channel we are using. We are able to split our remuneration between commission and salary (or equivalent), so it is convenient to think of our sales channels as salesmen. This input is another example of the cost-benefit relationships in the model. The more we spend on salesmen, the better access to the market we can expect, but of course the higher will be our expenses.

25. This allows us to test strategies that involve the use of third parties. For example we may use reinsurance to allow more rapid gross growth, or third parties to administer claims. The underlying principle is that we will somehow be giving away profit if we involve third parties, and that this will tend to feed through as a proportion of premiums.

APPENDIX C: THE MODEL

Outline

The model takes the form of an Excel workbook, containing several worksheets. These are summarised below, before a more detailed description of each.

Sheet Name	Description
Inputs	Main sheet for input assumptions (shown in blue)
Global Calculations	Calculated functions common to all cohorts of new business
Global Results	Summary of results for all projected cohorts
AccGross	Accounting worksheet with no allowance for reinsurance
AccNet	Accounting worksheet allowing for reinsurance
Ceded	Check on gross and net accounting worksheets
Cohort 1-10	Individual sheets with output for each assumed new business cohort

Inputs

Global inputs control the overall operation of the model, giving single point estimates for:

Market Retail Price Year 0	Benchmarking the whole model
Claim Frequency/Claim Probability	Used to decide probability of having claimed
Market Severity Year 0	Benchmarking the whole model
Proportion Earned in Written Year	Used for earning of exposure/premium
Proportion of Claims Incurred Paid by Year-end	Used for cashflows
Proportion of Premiums Payable Monthly	Used for cashflows/solvency calculations
Depreciation Period (Years)	Used for accounting
Retail Price Inflation	Basic measure of RPI
Risk Discount Rate	Used for profit-testing
Advertising vs. Commission importance	}
NHS Index importance	}These parameters all
Price change importance	}control the relative importance
Our price relative to market influence on basic persistency	}of other parameters in }formulae that determine market
Training vs. Commission importance	}size and market share.
Distribution effort importance	}

Assumptions that depend on calendar year include:

- Market Volume
- Frequency and severity inflation
- An 'NHS Dissatisfaction Index', used to measure people's desire for private cover
- Market Rates of Lapsing, Switching and New Entrants
- Advertising spend: Market and our Company
- An indicator of the strength of our Company's brand
- A proportion of the target market already on our Company's customer base (perhaps for other products)
- Rate of turnover of salesmen
- The number of salesmen we employ, and similarly for the Market
- An indicator of the barriers we might have against sales (for example more complex underwriting may make policies more difficult to sell)
- Our estimate of the Market's loss ratio
- Our estimate of the discounts that the Market can negotiate with hospitals, by virtue of its buying power
- Our expense assumptions, including per policy underwriting and policy set-up costs, administration and claims handling costs (either as amounts or in proportion to premiums)
- Costs (aside from commission) of employing one salesman, for the Market and for our Company
- Costs of recruiting and training one salesman.
- Average annual sales per salesman
- Capital/fixed expenditure including administration systems, hospital negotiation and marketing
- Cost of maintaining sales/distribution support for the Market and for our Company
- Relative persistency, dependent on whether or not previously claimed
- Relative tendency to claim, dependent on whether or not previously claimed
- Proportion of premium given away to third parties (e.g. TPA or reinsurer)

Most of these require input for each year (in blue) while assumptions in black bear some relationship to an initial assumption.

There is also the facility to allow for three assumptions to vary by calendar year and policy duration. These are mainly to allow for different pricing/commission strategies to optimise the effect of churning and selective lapsing. These assumptions are:

- Commission rates
- Market Commission rates
- A price adjuster to vary our central rate according to policy duration (for example we may wish to 'give away' the select effect, but price for selective lapsing at later durations.

Some of the inputs for this model are based on published market statistics, but many are more speculative, based to some extent on the authors' experience. It should be noted that the main purpose of the model was not to provide any conclusive results, but rather to provide the user with a tool to test their own assumptions. At the same time, it is hoped that some of the elements modelled will provoke further thought

amongst the profession about the influence that many of these assumptions could have on the outcome of a business venture.

Global Calculations

This sheet performs calculations relevant to every cohort of new business, including market retail price, frequency and severity, our own frequency and corresponding probabilities of having made a claim, which drive durational lapse assumptions. In addition, this sheet calculates our ability to reach potential new business cases, as well as the proportion of the market that is potential new business for our Company. Our expected hospital discount, given our hospital negotiating strength, drives our expected average claims cost, as compared with what the market is achieving.

Cohort 1 to Cohort 10

These sheets project the experience (including renewal) of cohorts of new business written in each of the next ten years. Our retail price is calculated by applying our price adjuster to the market rates, and this is used to estimate our ability to convert prospects to which our salesmen are exposed, which in turn feeds into a number of converted sales.

A similar approach is taken to estimate persistency at each subsequent renewal, and therefore volumes renewed. After converting written to earned exposure, it is a simple step to apply basic input assumptions, and therefore to generate financial projections.

Global Results

The first part of this sheet sums the financial and certain other output from the **Cohort** sheets. In addition, some of these are used to recalculate other statistics, such as average loss ratios (these are pink).

The next portion of the sheet brings together the overhead expense assumptions which have not already been allocated to the cohorts.

Finally the shareholders' cashflows, based on the accounting sheets (described below) are summarised, and used to develop an estimate of the value of the business as a whole, by whichever criteria are chosen.

Accounting Sheets

The most important sheet here is **AccNet**, which performs the full solvency calculation, allowing for any business ceded to a reinsurer (this is designed assuming quota-share, but can be adapted, with some simplifying assumptions, to allow for other forms of cover). **AccGross** feeds gross results into this sheet, while **Ceded** merely acts as a check that the cession implied by the difference between **AccGross** and **AccNet** is as expected.

Any user familiar with accruals accounting as described in the ABI SORP, and with the calculation of a Minimum Solvency Margin in accordance with the Third EU Insurance directive should be able to follow these calculations through. The objective of the sheet is to ensure just sufficient shareholders' funds at each year end to satisfy the statutory minimum – of course this can be adapted to allow a suitable margin in

excess of the minimum. The resultant transfers to and from shareholders' funds represent a profit signature, which is valued using a risk discount rate.

At the end of the ten-year venture, the minimum value of the residual business is taken to be net asset value. Other approaches might allow, for example, for potential brand damage if our Company decided to withdraw from this market.

APPENDIX D: PROBLEMS IDENTIFIED BUT NOT YET ADDRESSED IN THE MODEL

Volumes

During the development of several of the scenarios, we found an anomalous result that the size of our book was effectively independent of the size of the total market. The reason for this stems from the way that the model calculates new business volumes for each cohort year.

The total volume that we sell in a year is the product of the total market size, the proportion of the market looking for a new policy, our "Sales Reach", and a conversion ability measure. In the "Sales Reach" formula, we divide the product of the number of salesmen that we have and the number of sales each should make on average by the total number of sales made in the market last year. We also use the market size and proportion looking from last year in the total volume calculation. This means that the net effect is to assume that our salesmen's ability to sell is independent of the number and quality of salesmen in the rest of the market.

Each of the scenarios for which this caused a problem was adjusted *ad hoc* so that this anomaly was removed. However, we did not agree a single way to adjust the model. The possibilities are:

1. Replace the market size measure in the total volume calculation with current year figures instead of prior year figures. This should allow us more growth as the market grows. This is the approach taken in the "Reduction in State Cover" scenario.
2. Hard-key the number of sales per salesman in line with any reduction of the total market size. This is a reasonable approach if we are looking at a drastic reduction in the size of the market and the effect of subtle changes is not likely to be obscured by this rather imprecise approach. This is the approach taken in the "Rating Factors" scenario.
3. Build a relationship between number of sales per salesman and the total number of sales available in the market. This links our new sales much more directly with the total market size, and is more suitable when more subtle changes in market size are being tested. It is also better than the second option when our sales-force is of meaningful size (i.e. in the "Market Leader" scenario, where this approach was used).

We intend to agree a preferred approach to solving this problem, and releasing a version of the model with the chosen fix applied.

Commissions

Another interesting feature that was only revealed as scenarios were tested is that our volumes are independent of commission levels – both absolutely and relative to those offered in the market. Although a sudden change in commissions will have a one-off effect from one year to another, one might expect a company offering, say, half the market commission, to make fewer sales.

In the Personal market, for which the model was developed, this is not necessarily the case. Most Personal sales are still direct, and if the salesman can only sell your product, the commission incentive is less important than for an intermediary, through which most Corporate sales are made. Still, our commissions relative to the market should have an effect on our ability to recruit and retain direct salesmen, so we intend to look more deeply into this issue.