RATE IT AND FORGET IT!: going full circle with technical pricing

Start over

Rating

Business strategy

Rate monitoring

Profitability

Rate adequacy

New business monitoring

Loss ratio analysis

Business planning

Ana J Mata, PhD, ACAS

Managing Director

What is technical pricing?

First of all, I am deeply aware that the term technical pricing means very different things to most people working in the insurance industry and it is perhaps the term most inconsistently used among underwriters and actuaries alike. For some technical pricing is the same as benchmark pricing and for others benchmark pricing is a "mechanically calculated price" and technical pricing is the benchmark price adjusted for "subjective" underwriting considerations.

It will be virtually impossible for me address all definitions I have come across in this note, but rather I will start by clarifying the terminology I will use throughout this note and I will leave it up you to map the definitions herein to those you use or to those used within your organisation.

Throughout this note, I will use interchangeably the terms **technical pricing** and **benchmark pricing**.

In principle, the price or premium for an insurance policy is no different to the price of any other product: the final price paid by the buyer includes production costs, distribution costs, commissions for sales and a profit margin.

The key difference between insurance pricing and any other product is that the final "production" cost (claims costs) of the product being sold (a promise to indemnity the policyholder in case of loss) is not known at the time of selling the product. Therefore, BEFORE losses or claims actually occur we tend to use the term "expected loss or claims costs".

However, while it is challenging to estimate the expected claims costs of each policy within a portfolio or class of business, at the portfolio level most underwriters have a reasonable idea about the proportion of the overall premium that is required to pay for all losses arising from all policies, **also known as the loss ratio**.

Technical pricing at individual policy level is nothing but the allocation of claims costs or loss ratio to each policy within a portfolio based on the policy's risk profile or contribution to overall exposure to claims. **The key thing to understand with technical pricing is that there is a loss ratio (and therefore a claims cost) associated to the technical premium.** The loss ratio could be actual if the rates have been calibrated to claims experience, or assumed based on judgment or experience of the class of business.

In other words, the elements of technical pricing are premium, loss ratio and claims or loss cost, but one only needs two out of these three and the third one can be easily derived:

$$Overall\ loss\ cost = Overall\ premium * Loss\ Ratio$$

$$Loss\ Ratio = \frac{Overall\ loss\ cost}{Overall\ premium}$$

$$Overall\ premium = \frac{Overall\ loss\ cost}{Loss\ Ratio}$$

As simplistic as this may sound, let's say that an underwriter has been rating his class of business for the last 20 years with certain rates and rating factors. How he arrived at those rates and factors is almost irrelevant for now. Some years he charges more than the rates would suggest and some years he charges less that the rates would suggest. Let's also assume that in the last 20 years the loss ratio for his/her portfolio has been on average 70%, which may be a reasonable long term target for this class of business. If he now marries his rates and rating factors with the 70% long term average loss ratio, the result is a technical rating model.

Technical premium is the premium that is <u>expected</u> to support a certain loss ratio, underwriting profit or return on capital. Simply put, if you were to rate all your business at this technical rate, you would <u>expect</u> to achieve the loss ratio assumed in the rating model. The loss ratio could be the long term average, short term average or the plan.

The key word in this definition is EXPECTED. I can guarantee you that even if the rates and rating factors have been statistically derived from claims experience, precisely calibrated to a certain loss ratio and all business is rated exactly at these prices, the ACTUAL loss ratio on any one year will be different to that supported by the technical rating model.

The advantage of having a technical pricing is that one can consistently and systematically produce all underwriting minimum standard requirements such as:

- Rate monitoring on renewal business
- Allocate a loss ratio at policy level
- Produce Lloyd's benchmark pricing requirements (see definition below)
- Calculate rate adequacy at the policy and portfolio level
- Calculate rate monitoring for new business
- Reconcile pricing with the business plan
- Reconcile pricing and reserving
- Re-calibrate the technical rates in line with claim experience

All of these can be easily achieved if and only if one draws a clear distinction between the technical price derived from a rating process based on the risk profile and characteristics and the actual price agreed or charged for the policy. We will refer to the later as *bound premium*.

The objective of this note is to show you how you can apply the following recipe:

> ## TECHNICAL PRICING (AND ASSUMED LOSS RATIO)
>
> ## +
>
> ## BOUND PREMIUM
>
> ## =
>
> ## EVERYTHING ELSE CAN BE CALCULATED

Calculating the expected loss ratio at policy level

Some people are more comfortable estimating a loss ratio for each policy instead of calculating a technical price. In the following example I will illustrate that one can be derived from the other with simple algebra.

The key thing to understand with expected loss ratio is that the expected or actual loss ratio will be estimated using the bound premium, not the technical premium. This is because the bound premium is the money that will be actually received and the loss cost of the policy is independent of this. The loss cost for each policy only depends on the risk profile and it's given by technical price and assumed loss ratio in that technical price. An example will make things clearer.

Example 1: Let's assume that an underwriter rates a risk through the technical or benchmark pricing model and the model comes up with a technical price of £180,000. The technical price has been assumed to support a loss ratio of 65%. Thus, the expected loss cost for this policy is £180,000*65% = £117,000.

The underwriter binds the risk for £170,000 (less than technical price). Therefore, the expected loss ratio for this policy is (loss cost)/(bound premium) = £117,000/£170,000 = 68.8%. As we expected the loss ratio is higher than assumed in the rating because the premium charged is lower.

If we reversed the process and the underwriters prices the policy to £170,000 and states that he does not know the technical price but he expects the policy to have a loss ratio of 70%. This is the same as saying that he expects the loss cost for the policy to be £170,000*70% = £119,000. If his long term average or technical loss ratio is 65%, what would be the technical price for the policy?

Easy, with the loss cost and the technical loss ratio we can work out the technical price = (loss cost)/(technical loss ratio) = £119,000/65% = £183,076.

In conclusion, we always know the ***bound premium***, all we need is either a technical price accompanied by the supported loss ratio or the policy's expected loss ratio to work out everything else.

What is the advantage or benefit of allocating a loss ratio to each policy? The advantage is that one can monitor the overall expected loss ratio of the portfolio and reconcile with the business plan.

Example 2: Let's assume that the business plan loss ratio for 2011 is 75% and that as of the end of the first quarter there have been 10 policies bound. The technical pricing model is assumed to support a loss ratio of 70%. The following exhibit shows the technical price, bound premium and allocated loss ratio for each policy and the portfolio.

Some policies are priced above technical price and some below technical price. The expected loss ratio is the expected loss cost divided by the bound premium. At the end of the first quarter the portfolio has been priced slightly better than the plan loss ratio of 75%.

4

Technical premium	Bound premium	Expected loss cost	Expected loss ratio
£170,000	£175,000	£119,000	68.00%
£150,000	£132,000	£105,000	79.55%
£145,000	£140,000	£101,500	72.50%
£125,000	£127,000	£87,500	68.90%
£254,000	£225,000	£177,800	79.02%
£175,000	£168,000	£122,500	72.92%
£136,000	£145,000	£95,200	65.66%
£178,000	£175,000	£124,600	71.20%
£198,000	£200,000	£138,600	69.30%
£345,000	£320,000	£241,500	75.47%
£1,876,000	£1,807,000	£1,313,200	72.67%

Calculating Lloyd's benchmark price at policy level

One of the most recent requirements from Lloyd's as part of the underwriting minimum standards is that underwriters should report at the policy level the benchmark price (or technical price) that is required to achieve the business plan loss ratio (which could be different to the loss ratio assumed in the technical pricing).

If a technical pricing process is in place and we know the loss ratio supported by that rating model, calculating Lloyd's benchmark price is a matter of simple algebra.

Following from the example 1 above, let's assume that the business plan loss ratio for 2011 is 75%, the technical price is £180,000 and this supports a loss ratio of 70% and the bound price is £170,000. The loss cost is £117,000.

What is the premium that we would need to charge for this policy if we want the policy to have an expected loss ratio of 75% as plan?

I now have a loss cost (£117,000) and a loss ratio (75%), therefore the premium implied by these two is simply = £117,000/75% = £156,000. And this is the Lloyd's benchmark price.

Note that in this example the underwriter is charging (£170,000) less than technical price (£180,000) but more than is required to achieve the plan (£156,000). This contains a lot of meaningful information for underwriting management purposes.

Example 2 (con't): if at the end of the first quarter I have to report to Lloyd's the benchmark price for each of the ten policies bound, I simply add a new column which is the ratio of the loss cost and the business plan loss ratio of 75%.

Technical premium	Bound premium	Expected loss cost	Expected loss ratio	Lloyd's benchmark premium
£170,000	£175,000	£119,000	68.00%	£158,667
£150,000	£132,000	£105,000	79.55%	£140,000
£145,000	£140,000	£101,500	72.50%	£135,333
£125,000	£127,000	£87,500	68.90%	£116,667
£254,000	£225,000	£177,800	79.02%	£237,067
£175,000	£168,000	£122,500	72.92%	£163,333
£136,000	£145,000	£95,200	65.66%	£126,933
£178,000	£175,000	£124,600	71.20%	£166,133
£198,000	£200,000	£138,600	69.30%	£184,800
£345,000	£320,000	£241,500	75.47%	£322,000
£1,876,000	£1,807,000	£1,313,200	72.67%	£1,750,933

So far I have shown you how to derive a policy loss ratio, Lloyd's benchmark premium and how to reconcile pricing with the business plan simply by having a technical price with the supported loss ratio and the bound price.

Let's review the list of things I told you at the start we can do with a consistent technical pricing approach:

- Rate monitoring on renewal business
- Allocate a loss ratio at policy level (DONE)
- Produce Lloyd's benchmark pricing requirements (DONE)
- Calculate rate adequacy at the policy and portfolio level
- Calculate rate monitoring for new business
- Reconcile pricing with the business plan (DONE)
- Reconcile pricing and reserving
- Re-calibrate the technical rates in line with claim experience

In the next sections I will focus on the rate monitoring side of things including the concept of rate adequacy and new business monitoring.

Rate monitoring on renewal business

This is another area of great inconsistency in the market. Today, most companies have a rate monitoring *processs* in place and often numbers have to be filled in some system that then produces the rate monitoring report.

I have highlighted the process, because while most companies have a reasonable *process*, the inconsistency comes from how the numbers that are populated in the process are calculated. Often those numbers are completely disconnected from the technical or benchmark rating process and they shouldn't, they are essentially the same calculation.

Let's start with the definition of effective rate change.

The **effective rate change (ERC)** measures the change in market or bound premium relative to the change in <u>overall exposure</u>, between the current year and the prior year. Where the overall change in exposure is the overall change in risk profile including:

- number of exposure units (size)
- deductibles, limits, attachments,
- terms and conditions
- any other factors that affect exposure to losses

It's common practice in the insurance market for people to attempt to measure the change in all or some relevant risk factors such as: exposure units (for example, sum insured), limits, attachment/excess and terms and conditions. However, the overall change in exposure is made up of a combination of variables and it would be impractical to measure the change in each one of them. Think for example of personal motor insurance. The rating is done by taking into account a large number of variables:

- Age of driver
- Postcode
- Gender of driver
- Marital status of driver
- Type of car
- Age of car
- Miles driven per year
- Number of claims free years
- Type of usage
- Other drivers
- Where is the car parked
- And so on…

It would be impractical to try to measure the percentage change in exposure from each one of these rating variables. The overall change in exposure is simply the change in loss cost from one year to the next, or the change in technical price (assuming the loss ratio supported by technical rating has not changed). An example will make things clearer.

Example 3: a technical rating model supports a loss ratio of 70%. A risk has renewed and we have monitored technical and bound premium this year and last year as below:

2010 Technical premium = £220,000 (thus the loss cost is 70% * 220,000 = £154,000)
2010 Bound premium = £215,000
2011 Technical premium = £275,000 (thus the loss cost is 70% * 275,000 = £192,500)
2010 Bound premium = £260,000

Before I do any calculation, what would you expect to see: a rate increase? a decrease? or neutral?

Let's take a look: the bound premium has increased by a factor of 120.9% = (£260,000/£215,000) whereas the loss cost or technical price has increased by a factor of 125% = (£192,500/£154,000).

Both increased, but since the loss cost increased in a higher proportion, we have not charged enough to compensate for the increase in loss cost. Thus, we expect a rate decrease.

The effective rate change is the change in bound price *relative* or divided by the change in loss cost or exposure:

Effective rate change = 120.9% / 125% - 1 = -3.28%, a slight decrease. If we have increased the bound premium by 25% the renewal would have been "flat".

As you can see from this example, all I needed was the technical price and bound price this year and last year and in one simple calculation I got my rate monitoring.

Rate monitoring vs. rate adequacy

This is a good time to talk about rate adequacy.

True rate adequacy is assessed by comparing the achieved loss ratio (or underwriting profit) with the target loss ratio (or required underwriting profit) for a given year.

Example 4: assume all claims for 1999 are settled and paid and the loss ratio for year of account 1999 is 100% compared to a long term target loss ratio of 70%.

We can say now that rates for 1999 were inadequate. Rates in 1999 should have been 42.85% higher to achieve the 70% loss ratio.

But we do not want to wait 11 years to have an indication of rate adequacy. Thus, it would be useful if at the time of rating we have an indication of the adequacy of the rates being charged that particular year relative to some measure of profitability.

Rate adequacy can also be assessed using the technical pricing. Remember that technical pricing has an implicit assumption about loss ratio and therefore, underwriting profit.

Rate adequacy is defined as the ratio between bound premium and technical premium or the "deviation" between bound premium and technical price.

The lower the bound premium with respect to technical price the more "inadequate" market rates are and viceversa.

The closer the bound premium to technical price, the closer we **expect** the loss ratio to be to the technical pricing's loss ratio.

In this context (in)adequacy is relative, not absolute.

Back to the example related to rate monitoring. Let's look at the rate adequacy in 2011 vs. the rate adequacy in 2010.

In 2010, the rate adequacy was £215,000 / £220,000 = 97.7% and in 2011 the adequacy was 94.5%. we can see that in the renewal the bound premium was more "inadequate" than in 2010, therefore we expect a worse loss ratio and therefore a rate decrease.

Now we can re-define effective rate change as the change in rate adequacy relative to the technical price. In this example, the rate change is:

2011 adequacy / 2010 adequacy – 1= 94.5% / 97.7% - 1 = -3.28%

A different calculation, same result. However, what I have found throughout the years of training and working with underwriters is that the find easier to understand the concept of rate adequacy than the concept of rate monitoring, even though they are the same.

Rate monitoring for new business

In the last couple of years there has been significant focus on monitoring rates for new business because after all the new business premium also contributes to the overall exposure and therefore loss ratio of a portfolio. If new business premium is not rate monitored, one can write only new business and wrongly state "rate change for the portfolio is 0%", while all the new business could be written at a quarter of the technical price!

While it is reasonable to attempt to measure "rate changes" for the new business written, most people are trying to answer the wrong question: *"what is the rate change for new business?"*

In an attempt to answer this question, underwriters try to second guess what was the premium the policy paid last year to the other company that wrote the policy. The truth is that for the company assuming the new business the expiring price is irrelevant because for each company what matter is the bound premium *relative* to their own technical price.

For new business the questions that one should be asking and attempting to answer are:

"Relative to technical pricing, what is the difference between new and renewal market price?"

"What is the impact of writing new business on the overall rate adequacy?"

"What would be the impact on the overall profitability of writing new business?"

And the ONLY way to answer these questions is with a consistent approach to technical pricing.

Example 5: Let's assume that in 2010 a portfolio consisted on just one policy. In 2011 the policy is renewed and one new policy is added to the portfolio. What is the overall rate change for renewal business and for the overall portfolio are questions that can be easily addressed by comparing the change in rate adequacy.

The exhibit below show the technical price and bound price for each policy together with the relative rate adequacy (bound premium to technical premium). As we can see the renewal policy changed from above technical price to below technical price. This implies a decrease in rate of -2.79%. However, the new business was written significantly below technical price, driving the overall rate adequacy of the portfolio down.

9

Using the concept of rate adequacy I can calculate the overall rate change for the portfolio as 91.58%/100.85% - 1 = -9.2%.

Year	Technical price	Bound price	Rate adequacy
2010	£292,500	£295,000	100.85%
2011	£331,500	£325,000	98.04%
2011	£351,000	£300,000	85.47%
Total	£682,500	£625,000	91.58%

If I had not included the new business in the overall adequacy the rate change would have been misleading.

Once more, all I needed to do rate monitoring, rate adequacy and new business monitoring was simply have a technical price and the bound price. That's how easy, and the level of mathematics need is so basic that anyone with decent skills in Microsoft Excel© could put these reports in place.

So far we have covered everything on the list above except the last two points:

- Reconcile pricing and reserving
- Re-calibrate the technical rates in line with claim experience

Technical pricing and true rate adequacy

One question that I get asked time and again is: what would happen if we derive everything from technical pricing as described in this note, but the technical price is wrong to start with. This is one of the most interesting parts of technical pricing, is that it does not need to be right because all results are relative. For example, if I calculate the rate change using technical pricing and technical pricing is off by a factor or 1.2 (should have been 20% higher), then the same correction factor would have to be applied to the technical price this year and last year and because we are taking a ratio of two numbers it cancels out!

Thus, I always advocate that consistent technical pricing is more important than accurate technical pricing at least to get started then over time we can re-calibrate as experience proves one way or another.

As I said before, assessing true rate adequacy could take years, but once we have an idea of the actual loss ratio of a portfolio we can evaluate the validity of the technical pricing approach. Quarterly or annually one can take a look at how the portfolio was priced and how experience is performing through the reserving analysis and reconcile the areas where pricing needs to be fine tuned in light of claims experience.

10

The second most important consideration when putting together a technical rating model is to aim to have a database in order to capture as much exposure information at the policy level together with technical pricing and bound premium. This will allow us to:

- Automate reports (everything regulators and Lloyd's are asking for in compliance with Solvency II)
- Reconcile pricing and reserving
- Re-calibrate rates and rating factors over time.

Without a database one can end up with thousands of files with data that is impossible to analyse.

If you are reading this far, that means this was of interest to you. If you would like to find out more details about insurance rating and technical pricing, regardless of your level of experience and degree of depth you may be interested in learning, you may want to consider some of our forthcoming courses:

- Actuarial techniques for underwriting management, 28 March 2011
- Actuarial methods and concepts for underwriters, 16-17 May 2011
- Basic actuarial concepts for non-actuaries, 13-14 June 2011

Registration is open on line at www.matblas.com\register.php, or by phone 020 7510 9692 or by e-mail at training@matblas.com

I look forward to seeing you in one of our courses this year.

Yours sincerely,

Ana J. Mata, PhD, ACAS
Managing Director