

ACTUARIAL ASPECTS OF HEALTH INSURANCE PRICING

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Health Insurance pricing is not always recognized as a complex actuarial domain and the basics and principals are relatively unknown to people outside the healthcare community. This article should give an overview about the basic principles of the health insurance premium calculation and the complex factors influencing health insurance risk.

At the outset it is necessary to familiarize the reader with two fundamentally different calculation principles on which health insurance business can be based:

1. The principle of solidarity, which for example can mean that the premiums depend on the income of the insured persons, rather than purely on risk factors influencing the probability of claim and claim size. In general, the total premium for a given class of insured people (e.g. income group), varies significantly from the total claim this class has to expect. Applying the solidarity principle usually means that social factors (such as income, family status etc.) are more significant in determining the premium than pure risk factors such as health status or age. Statutory health insurance is often based on this principle – frequently the premium is determined as percentage of income.

2. The principle of equivalence, which means that over the entire period of insurance the total premium of a given category of equivalent risks, matches the total of claims, including expenses for underwriting and administration, for that particular risk class. In this case it is necessary to calculate a risk premium, i.e. the premium is calculated strictly according to risk factors and categories. Private health insurance products are mainly calculated on the principle of equivalence.

Sometimes both principles are applied as a mixture: For example, “family discounts” granted for a typical private health insurance product provides for some solidarity element, but these discounts may not reflect the actual risks; such product features may be introduced for marketing reasons.

Given a clear definition of the insured events, i.e. defining the potential liability, it is the actuary’s job to determine relevant risk factors which have to be taken into account in the premium calculation, e.g. the age of the insured person, sex, etc. Different approaches can be used in the calculation. Such approaches depend on the statistics available, as well as of the characteristics of the product design. However, it is necessary to note that the risk factor considerations within the premium calculation are distinct from individual risk assessment in the underwriting process. By underwriting we mean a process by which risk factors of individuals or groups are compared with the premium calculation assumptions, and if necessary to load the individual or group premium with a risk loading or even to exclude certain illnesses/events.



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The following roughly describes the important steps of private health insurance premium calculations. The first step of the premium calculation is the calculation of the risk premium taking into consideration the various risk factors. For the next step from the risk premium to the net premium, we have to distinguish between individual and group insurance business. In group business, the net premium is usually simply the risk premium with a safety loading. As concerns individual business, we have basically three alternatives to calculate the net premium:

- risk premium + safety loading (like in group business)

- level premium (including a reserve for increasing risks due to age)
- solidarity premium

Why can it be useful to have a reserve? Generally young people generate very much lower healthcare costs than older ones. For example, experience in India has shown that claims of a 60 year old insured are 2.3 times higher than those of a 30 year old insured. To avoid having older insureds pay exorbitant premiums, it is possible to have young insured pay an ageing reserve for future liabilities as an addition to their risk premium, which is then used to moderate future premiums when the insured surpasses a certain age. By this method of level premium calculation, the premium can be kept theoretically constant on an as if basis (during the lifetime of the insured person). Although we are talking of a level premium, we cannot guarantee a constant premium over the lifetime, because of increasing costs of medical treatment, advanced medical technology, new treatment procedures, new diseases that change life expectancy etc.

Usually a level premium is only used in individual health insurance, because in group business the life-long character of the group is not very determinable, since the composition of the group is often changing.

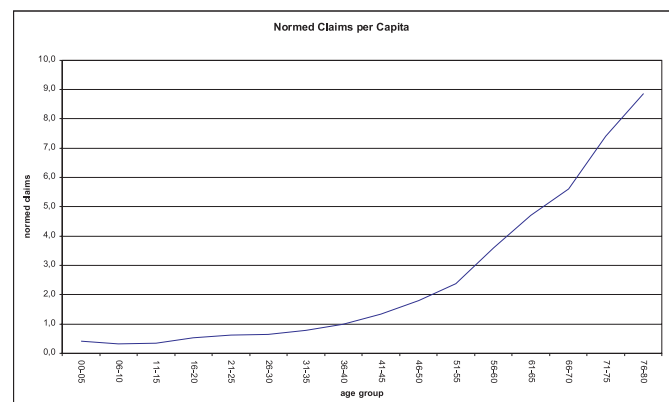
In principle, premiums are calculated in accordance with risk factors; however, from a marketing point of view, it is sometimes advisable to cross-subsidize high risk factor categories with lower risk factor categories. In this case we would quote a solidarity premium.

Example: The coverage of maternity claims. The premium for men between 20 and 40 is usually made higher to compensate the maternity costs of women in this age group. If done so, it is essential that the underwriting process ensures that the actual gender mix be close to the assumed mix of cross subsidized risks, in order to avoid anti-selection. In our example, it would mean to pay attention that the number of insured men and women between 20 and 40 years is balanced and matching with the assumptions made.

In group business, the homogeneity of the group is a very important factor. Furthermore, the underwriting and administration costs for group policies are lower than in individual business. This should be considered when it comes to the calculation of the gross premium, which consists in general of the net premium plus the costs for underwriting and administration and profit loading.

To calculate the insurance premium based on the equivalency principle, it is necessary to estimate the risk the insured represents. So criteria must be identified to enable us to estimate which costs the individual insured or the community of insureds will occur in the next year. These criteria are called

Chart 1: Risk Factor Age



risk factors. Risk factors such as age and sex influence the claims frequency and the size of the costs of claims.

The diagram shown highlights the impact of the risk factor "age". It shows the development of inpatient costs (without maternity costs) in India depending on age:

Another important risk factor can be the occupation of the insured persons. There are some professions with a very much higher health risk than others as the table below proves:

Table 1

Profession	Claim per capita in relation to the claims per capita of the whole portfolio of insured's between the age 55-64
Office employees	101
Teachers	99
Pharmacists	80
Shop owners	96
Sportsmen	117
House wives	121

Please note: Such claims figures are very specific for each country, because they depend on the work ethic and other social factors of the respective country. The figures above are from Germany.

In large countries like India, the medical supply and the cost of medical treatment substantially differ by region. The table below shows certain regional differences in India:

Table 2

Region of	Claim per capita in relation to the claims per capita of the whole portfolio of insureds between the ages 55-64
Metro	1.3
Non-Metros	0.9

Other risk factors can consist of the following:

- *medical history of insureds can be roughly categorized as a standard risk category or increased risk category A,B,C, etc., the higher the category the more severe is the expected impact on the health insurance risk*
- *habits* like smoking, drinking, nutrition
- *activities* such as sports and occupational activities
- *socio-economic class can go along with* different habits to consult doctors, different medical knowledge level and different possibilities to get medical treatment
- *climate and living conditions* vary significantly in a large country like India; considering these differences, it is expected that diseases are more or less frequent depending on climate and living conditions

The impact of risk factors on the premium calculation can generally be classified as the following:

Table 3

risk factors	impact
sex	high
age	high
occupation	middle
medical history	middle – high
activities	low
habits	low
socio-economic class	low
region	middle
climate and living conditions	low - middle

In group business, we have to consider some particular risk factors:

- the size of the group: not only does the group size as such play an important role but so does the size of classes of insureds within the group. If the portfolio is not large enough -we speak in this context of "*critical size*"- individual group rating becomes impossible.
- the composition of the group in terms of age distribution, distribution of gender, etc.
- the branch of the group (industry, trade, services, etc.) and composition of occupations.

There are many additional factors influencing the risk premium in a more complex and not easy measurable way, like:

The *type of cover* and the nature of benefits determine the extent of having a high or low possibility of a claim, e.g. does the product invite anti-selection or not? For instance, it makes a difference in pricing if an outpatient benefit is offered as a stand-alone coverage or only in combination with comprehensive inpatient coverage. The *level of cover* is generally determined by limits and deductibles and/or coinsurance. Any such feature reduces the exposure. *Selection/Anti-selection* is characterized by the question of how quickly and with what purpose an insured can substantially benefit from the policy. The underwriting process is crucial to avoid anti-selection and is basically supported by a proper design of the policy terms and conditions and the right combination of benefits. For example, in the case of products with maternity coverage, it is necessary to avoid insuring persons only for the period of maternity. The risk of *moral hazard* is higher than in many other domains of personal insurance - especially higher than in life insurance- since insureds can claim several times during the term of insurance and there is the additional complication of the involvement of third parties like medical providers. A general assessment of possible moral hazard must be considered in the calculation factors, i.e. assumptions for premium loading independent of having the capability to enforce claims control. The *style of policy and claims underwriting* plays an important role when it comes to pricing. It is important in how far medical underwriting is to be introduced to the whole or just parts of the portfolio, like only to insureds above the age of 45. The efficiency of claims underwriting depends a lot on the medical provider sector, which type of contractual relationship exists between provider and claims underwriter, and how the medical provider sector is regulated and supervised. *General exclusions* of certain diseases and events (like war and epidemics) as well as dangerous activities (like mountain climbing, parachuting, etc.) are in principle not insurable under one year policy contracts and are therefore often generally excluded. Incentive features like *no-claims bonus* can reduce the risk of moral hazard and have usually a positive effect on the selection of risks for both new and renewed business. By this measure, the relation between premium and claims is improved. However, when it comes to pricing it must be considered as a surplus cost-factor. *Medical inflation* is the overall and foreseeable increase in medical costs during a certain period of time. Medical inflation must be considered in the calculation of the premium, this premium being paid to cover future health care expenses in the forthcoming policy period. *Jurisdiction* can be a limiting factor in the definition of products and hence it can have impact on the pricing, e.g. some countries do not allow (or only hardly allow) that the insurance company terminate a health insurance policy, or permit premium adjustment only under certain circumstances. By classifying the impact of these additional risk factors on the premium calculation, we obtain the table below:

Table 4

risk factors	impact
type of cover	high
level of cover, limits	high
selection/anti-selection	middle
moral hazard	middle
form of underwriting	high
general exclusions	high

deductible/co-insurance	high
no-claims bonus	high
Medical inflation	high
jurisdiction	low

The above shows that in order to be able to select the right pricing model for a certain product in a certain market, it is absolutely essential that the actuary not only understands the basic calculation principles but also the various risk factors and their potential impacts. As a next step, various pricing models could be introduced and discussed.

ANNOUNCEMENT

PENSIONS & SOCIAL SECURITY BOARD ANNOUNCES

SEMINAR ON

CURRENT ISSUES IN RETIREMENT BENEFITS (CIRB)

Venue : Hotel Ramee Guest Line, 462, A B Nair Road, Near Hare Rama Hare Krishna Temple, Juhu, Mumbai 400 049
Tel Nos. 5690 5555/5693 5555
Mobile:- 9820729938

Date / s 23(Friday) – 24(Saturday), December 2005

Venue Hotel Ramee Guestline, Juhu Beach, Mumbai 400 049

Contact point **Gururaj Nayak** in ASI office at gururaj@actuariesindia.org

Programme **Non-residential**
 However, we have got competitive rates from Hotel Ramee Guestline at Rs.3600/- + Tax which would include complementary breakfast, Dinner and airport pick-up and drop. For booking, please give us advance intimation.

Dress Code Smart Casuals

Programme 23 12 2005

Schedule 09.15 a. m. to 05.15 p. m. followed by at 7.30 p. m. Pre-Dinner address, cocktail and Dinner

24 12 2005

09.15 a. m. to 01.30 p. m.

Participation fee Rs.5,000/- (Rs. Five thousand only)

Who are expected to attend

- Officials working in Group & Pensions business of Life Insurers
- Officials working in Re-insurance Companies.

Objectives

- ASI members practicing in retirement and other Employee benefit areas.
- ASI members working in consultancy entities.
- ASI members working in NIA, IRDA, EPFO and other Government/Public Sector organisations.
- Academics interested in the subject of Retirement Benefit Provisions
- Special invitees; actuaries and non-actuaries

The Objective of the Seminar in particular is;

- To achieve greater level of commonality of understanding in actuarial and other aspects of actuaries' work in Retirement Benefit areas.
- To deliberate on GNs under due processes
- To deliberate on GN 26: Actuarial Reports required under AS 15 (Revised, 2005) and AS 15 (Revised 2005) and firm up views on changes if any required in the same.
- To deliberate on issues relating to recent development in IAS 19 (Revised 2004)
- To deliberate on Professional conduct – compliance and monitoring issues
 Discussion on Group Insurance Products; Life, Non-Life and Health Insurance

CPD credit to

ASI members

Registration

7 ½ hours to apply for retirement & other Employee benefit actuarial work and work of actuary in Life Insurance.

Latest by 15 12 2005

Participation is restricted to 40 persons.

Registration on first-come-first served basis

CURRENT HAPPENINGS

- Seminar on Issues Relating to Detariffing of General Insurance Business on 14th December 2005 at Hotel Ramee Guestline, Mumbai arranged by General Insurance Board
- Workshop on GN7 - Appointed Actuary (AA) and Principles for determining Margins for Adverse Deviation (MAD) in Life Insurance Liabilities on 14th December 2005 at Hotel Sea Princess, Mumbai arranged by Life Insurance Board