Using Taiwan National Healthcare Database
to Model Cancer Insurance

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Abstract

Prolonging life expectancy is a common phenomenon since the early 20th century. However, living longer indicates longer morbidity time and spending more in health care. Thus, in addition to annuity insurance products, health insurance products become popular in countries with longer life. In Taiwan, the most popular health related product is the cancer insurance since cancer has been the leading death cause for 31 consecutive years (since 1983). But pricing the cancer insurance is not easy and lacking the experience rate and good data quality are two main reasons. Fortunately, Taiwan began to implement the national healthcare insurance (NHI) in 1995 and more than 98% of Taiwan population are covered. In this study, we will use the Taiwan NHI database to price the cancer insurance products.

Catastrophic diseases (CD) are one of the key features of NHI and those who are judged with the CD can waive their deductibles for cost related to the CD. The judgment of CD is based on the medical diagnosis and professional opinions from a group of physicians from different medical institutions. The CD accounts for about 30% NHI total cost, despite that only 4% of population are with the CD, and the cancer is the largest group (about 50%) among those with CD. Since the NHI has almost the whole Taiwan population data, it would be more reliable to evaluate the cancer risk using the NHI database, comparing to using the experience (sample) data from insurance companies.

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Three databases are considered in this study: personal identification (HV-ID), out-patient visits (HV-CD), and in-patient visits (HV-DD). Because these databases are fairly big (more than 20 GB), we first use the database software to debug and clean the errors in the databases. Then, we calculate the age-specific incidence rates and mortality rates, following by applying these rates to design the cancer insurance products. Also, similar to including the longevity risk in pricing the annuity products, we use the stochastic models (such as the Lee-Carter model) to capture the annual improvements of cancer incidence and mortality rates.