



# Financial services associated with insurance and pension schemes (Insurance)

Regional Course on 2008 SNA (Special Topics):  
Improving Exhaustiveness of GDP Coverage

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United Nations Statistics Division



## Outline of presentation

- Financial services associated with insurance and pension schemes
  - **Non-life insurance**
  - **Standardized guarantee schemes**
  - **Life insurance and annuities**
  - **Reinsurance**
  - Social insurance schemes (next presentation)



## Importance of insurance

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The Economist

### Insurance in Asia Astounding claims

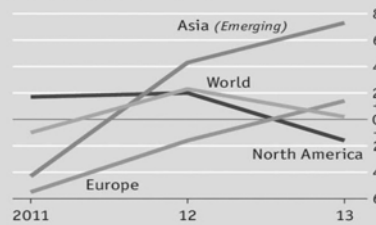
For insurers, Asia is a cauldron of innovation, but also of competition  
Jun 13th 2015 | From the print edition

ASIANS are becoming older and richer, which should mean plenty of business for insurers. Age, after all, increases the need for health insurance; wealth brings property to protect. The region's middle class is expected to balloon from 525m in 2009 to 3.2 billion by 2030, according to BCG, a consultancy. Household wealth will double over the coming decade, from \$81 trillion today to \$174 trillion by 2025. Thanks to increased life expectancy, the region's army of pensioners will grow rapidly, especially in China, which already has 132m people over the age of 65. Rich-country diseases are proliferating too: by 2030 half of the world's new cancer cases will be in Asia and, according to Swiss Re, a reinsurer, non-communicable chronic conditions such as heart disease could account for 67% of deaths in India.

No wonder that insurance in the region is indeed booming. In 2013 premiums grew by 7.3%, compared to 1.4% in Europe and a decline in North America (see chart). In 2003 Indonesians spent \$7 a person on life insurance; in 2013, \$59.

Yet Asia remains woefully underinsured. Western countries typically spend 7-8% of GDP on insurance; in 2013 Asian ones, excluding Japan, spent 3% on average. That is all the more inadequate given that governments have no plans to develop cushy public safety nets. Instead, they are opening up their insurance markets, in the hope that these can help shoulder the growing cost of health care and retirement. In India, where patients pay around 68% of medical bills directly and insurers only 3%, the government recently loosened

### The place to be Insurance premiums Real % change on a year earlier



Sources: Sigma world insurance database; Swiss Re

- Rising demand for insurance implies the need to measure the output properly in national accounts

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## Non-life insurance

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### Approaches to calculate output

- Expectations approach
- Accounting approach
- Cost approach

### Why these approaches?

- Avoid the situation where output could be extremely volatile (even negative) when calculated using the 1993 SNA algorithm in cases of catastrophic losses

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### Expectations approach

- Replicates an ex ante model used by insurance corporations to set premiums
- Output is calculated as
  - Premiums earned
  - Plus expected premium supplements
  - Minus expected claims incurred
- Premiums earned are that part of actual premiums that relates to cover provided in the accounting period

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### Expectations approach – expected claims incurred

$$L_{t+1|t} = l_{t+1|t} \times P_{t+1}$$

- $L_{t+1|t}$  = expected claims incurred in period  $t+1$
- $l_{t+1|t}$  = geometrically weighted expected claims incurred ratio in time period  $t+1$ , given the information available in time period  $t$
- $P_{t+1}$  = premiums earned in time period  $t+1$

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## Non-life insurance

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### Expectations approach – expected claims incurred

- $I_{t+1|t}$  is computed as  $I_{t+1|t} = E(I_{t+1}|I_t, I_{t-1}, \dots)$  so the geometrically weighted moving average model takes the form

$$\begin{aligned} E(I_{t+1}|I_t, I_{t-1}, \dots) &= \alpha I_t + (1-\alpha)E(I_t|I_{t-1}, I_{t-2}, \dots) = \alpha \sum_{i=0}^{\infty} (1-\alpha)^i I_{t-i} \\ &= \alpha I_t + \alpha(1-\alpha)I_{t-1} + \alpha(1-\alpha)^2 I_{t-2} + \dots \end{aligned}$$

- $I_t$  = claims incurred ratio ( $L_t/P_t$ )
- $L_t$  = claims incurred in period  $t$
- $P_t$  = premiums earned in period  $t$
- $\alpha$  = smoothing parameter to be estimated

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## Non-life insurance

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### Expectations approach – expected premium supplements

$$I_{t+1|t} = i_{t+1|t} \times P_{t+1}$$

- $I_{t+1|t}$  = expected premium supplements in period  $t+1$
- $i_{t+1|t}$  = geometrically weighted expected investment gain/loss ratio in time period  $t+1$ , given the information available in time period  $t$
- $P_{t+1}$  = premiums earned in time period  $t+1$

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### Expectations approach – expected premium supplements

- $i_{t+1/t}$  is computed as  $i_{t+1/t} = E(i_{t+1} | i_t, i_{t-1}, \dots)$  so the geometrically weighted moving average model takes the form

$$\begin{aligned} E(i_{t+1} | i_t, i_{t-1}, \dots) &= \beta i_t + (1-\beta) E(i_t | i_{t-1}, i_{t-2}, \dots) = \beta \sum_{i=0}^{\infty} (1-\beta)^i i_{t-i} \\ &= \beta i_t + \beta(1-\beta) i_{t-1} + \beta(1-\beta)^2 i_{t-2} + \dots \end{aligned}$$

- $i_t$  = net investment gain/loss ratio ( $I_t/P_t$ )
- $I_t$  = net investment gain/loss in period  $t$
- $P_t$  = premiums earned in period  $t$
- $\beta$  = smoothing parameter to be estimated



### Expectations approach to incorporate catastrophic losses

- Compute expected claims incurred ratios with the data for the year with the catastrophe treated as missing observation
- Compute the catastrophic claim ratio as the difference between the actual claims incurred ratio and the estimated claims incurred ratio
- Spread catastrophic claim ratio forward equally for 20 years, starting from the year with the catastrophe
- Add the adjustment for the catastrophic claims ratio to the forecast of claims incurred ratios for the subsequent years



### Expectations approach

- Approach requires availability of relatively long time series data to ensure that the weights sum up or are close to one
- Typically at least 30 observations are needed
- A number of intermediate steps are needed to derive output
- Approach may be more suitable for compiling agencies with technically competent staff
- Worked examples 3.10 and 3.11 on pages 121 and 126 of financial handbook show how to compute output and other transactions using this approach with and without catastrophic claims

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### Accounting approach

- Output is calculated as
  - Premiums earned
  - Plus premium supplements
  - Minus adjusted claims incurred
- Adjusted claims incurred are determined ex post as the sum of actual claims incurred plus the changes in equalization provisions (ie additions to less withdrawals from equalization provisions) and, if necessary, changes to own funds (ie additions to less withdrawals from own funds)

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### Accounting approach

- The item “changes in equalization provisions” is an entry in the accounts of insurance corporations that gives a guide to the funds the insurance corporations set aside to meet unexpectedly large claims
- In circumstances where the equalization provisions are insufficient to bring adjusted claims back to a normal level, some contribution from own funds must be added also
- Provided the required data are available, this method may be more suitable for compiling agencies that may not be in a position to implement the expectations approach

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### Cost approach

- Output is calculated as the sum of costs
  - Intermediate costs
  - Compensation of employees
  - Return to fixed capital
  - Other taxes less other subsidies on production and imports
  - Allowance for “normal profit”
- Allowance for normal profit can be obtained by smoothing past actual profits, with the length to be decided by the compiling agency
- This approach is to be used if there are insufficient data to calculate output using the expectations or accounting approaches

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### Allocation

#### Bottom-up approach

- If reliable input data for each line of non-life insurance by sector are available, calculate the output allocated to each sector directly
- Sum up the sectoral data to get the national data

#### Top-down approach

- If reliable sectoral input data for each line of non-life insurance are not available, calculate the total output
- Allocate the total output to each sector using available data such as sectoral actual premiums in proportion to total actual premiums

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### Volume measures

- The ideal method of deflating the current-price output by a corresponding output price index to obtain the volume measure is not feasible because it is not possible to directly observe prices which represent the true nature of non-life insurance output
- What are the practical solutions?

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### Volume measures under expectations and accounting approaches

- For each type of non-life insurance
  - Deflate current-price measures of premiums earned plus premium supplements by an appropriate price index (for example, the price index for insurance premiums from CPI or PPI)
  - Compute growth rate of unchained Laspeyres volume measures of premiums earned plus premium supplements (this growth rate is a proxy for growth of insurance services)
  - Use the growth rate to extrapolate the current-price insurance output insurance to obtain corresponding unchained Laspeyres volume measure



### Volume measures under expectations and accounting approaches

- Sum up unchained Laspeyres volume measures of each type of non-life to obtain corresponding total non-life insurance output
- Compute growth rate of unchained Laspeyres volume measure of total non-life insurance output
- Compute annually-chained Laspeyres volume measure of each type of and total non-life insurance by extrapolating the real growth rates from a reference year



### Volume measures under expectations and accounting approaches – example

- Time period  $t$ 
  - Earned premiums = 750.0
  - Premiums supplements = 63.0
  - Sum of earned premiums and premium supplements =  $750.0 + 63.0 = 813.0$
  - Current-price non-life insurance output = 272.0
- Time period  $t+1$ 
  - Earned premiums = 771.0
  - Premium supplements = 65.3
  - Sum of earned premiums and premium supplements =  $771.0 + 65.3 = 836.3$
  - Price index for insurance premiums (previous year = 100.0) = 103.5

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### Volume measures under expectations and accounting approaches – example

- Time period  $t+1$ 
  - Unchained volume measure of earned premiums and premium supplements =  $(836.3/103.5)*100 = 808.0$
  - Growth rate of unchained volume measure of earned premiums plus premium supplements =  $[(808.0/813.0) - 1]*100 = -0.6\%$  (which is proxy for real growth of non-life insurance)
  - Unchained volume measure of non-life insurance output =  $272.0*(808.0/813.0) = 270.3$

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### Volume measures under cost approach

- Deflate the current-price output by a composite index of input prices to obtain the volume measures

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## Standardized guarantee schemes

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- Standardized guarantees comprise the sorts of guarantees that are issued in large numbers, usually for fairly small amounts, along identical lines
- Examples include export credit guarantees and student loan guarantees
- Three parties are involved in these arrangements
  - Debtor
  - Creditor
  - Guarantor (can be financial corporation or government unit)
- Either the debtor or creditor may contract with the guarantor to repay the creditor if the debtor defaults

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## Standardized guarantee schemes

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### Standardized guarantees provided by financial corporations (private or public)

- Paradigm is similar to non-life insurance as the financial corporation expects all fees paid, plus the investment income earned on the fees and any reserves, to cover expected defaults, along with the costs, and leave a profit
- Method to calculate and allocate output is similar to approaches to calculate and allocate non-life insurance output

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## Standardized guarantee schemes

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### Standardized guarantees provided by general government

- Provided without fees or at such low rates that the fees are significantly less than the calls and administrative costs
- Output is calculated as the sum of costs

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## Standardized guarantee schemes

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### Volume measures

- For output produced by financial corporations
  - Methods to calculate volume measures of non-life insurance output can be used
- For output produced by general government
  - Deflate current-price output by composite index of input prices to obtain the volume measures

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## Life insurance and annuities

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### Life insurance

- Output is calculated as
  - Premiums earned
  - Plus premium supplements
  - Minus benefits due
  - Minus increases (plus decreases) in actuarial reserves and reserves for with-profits insurance
- Actuarial reserves for life insurance and reserves for with-profits insurance represent the amounts set aside for the payment of benefits in the future

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### Annuities

- Output is calculated as
  - The investment income attributable to the annuitants
  - Minus the amount payable to the annuitants (or surviving beneficiaries) under the terms of the annuity
  - Minus the change in the annuity reserves, but excluding the initial payments for new annuities
- The holder of a life insurance policy and annuity is always an individual so their output is consumed by households (resident and non-resident)
- Worked example 3.18 on page 158 of financial handbook shows how an annuity works

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### Allocation

#### Bottom-up approach

- If reliable input data for resident and non-resident households are available, calculate the output allocated to each sector directly
- Sum up the sectoral data to get the national data

#### Top-down approach

- If such data are not available, approach is broadly similar to that for non-life insurance

### Volume measures

- Method is similar to those for non-life insurance

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## Reinsurance

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- Reinsurance is insurance between one insurance corporation and another
- A few large corporations specialize in this activity and they are concentrated in a few financial centres
- Many flows involve the rest of the world
- There are two types of reinsurance
  - Proportionate reinsurance
    - Reinsurer accepts an agreed proportion of the risks
    - Any reinsurance commission paid by reinsurer to policyholder is treated as a reduction in reinsurance premiums
  - Excess of loss reinsurance
    - Reinsurer undertakes to pay all losses over a given threshold
    - If there are no or few claims above threshold, reinsurer may pass share of profits to direct insurer

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## Reinsurance

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- Output is calculated as
  - Premiums earned less commissions payable
  - Plus premium supplements
  - Minus both adjusted claims incurred and profit sharing
- Worked examples 3.20 and 3.21 on pages 169 and 174 of financial handbook show how to calculate and allocate reinsurance output under proportionate and excess of loss reinsurance

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### Allocation

#### Bottom-up approach

- If reliable input data for resident and non-resident direct insurers are available, calculate the output allocated to each sector directly
- Sum up the sectoral data to get the national data

#### Top-down approach

- If such data are not available, calculate total output
- Allocate the total output to each sector using available data such as sectoral actual premiums in proportion to total actual premiums

#### Volume measures

- Method is similar to those for non-life insurance



**Thank you**