Introduction to Insurance

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Tbilisi, Georgia
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Introduction to Insurance

- Principles of insurance
- introduction to non-life insurance
- introduction to life insurance
- introduction to annuities
- introduction to reinsurance
- prudential regulation
- review through ratios

Principles of Insurance

- development impact
- pooling of risk
- antiselection
- random chance
- statistical fluctuations and reinsurance

Principles of Insurance

- Development Impact
  - enforcing level of safety
  - providing for families
  - impact on bond market

Principles of Insurance

- Pooling of Risk
  - everyone contributes money to a pool
  - claims are paid from the pool
  - magic of pooling eliminates risk

Principles of Insurance

- Pooling of Risk
  - each pool has a different level of risk
  - companies establish pools for specific risks
  - each pool has a different premium

Principles of Insurance

Question: An advertisement in a life insurance journal shows an overweight man puffing and sweating as he climbs the steps of a public building. The caption says, "Your company may think this man is uninsurable but to us he is a standard risk."
How could two insurance companies view the same risk so differently?

Principles of Insurance

Question: Some jurisdictions argue that charging higher automobile insurance rates to young people is discrimination by age and companies should not be allowed to do so. The companies have statistics that show significant differences in experience by age. If the companies are not allowed to differentiate by age, when it is so statistically significant, how will the companies be able to write auto insurance without huge losses?

Principles of Insurance

- Antiselection
  - A company selects who can be in the pool
  - An individual who circumvents the rules selects against the company or antiselects
  - Antiselection means the pool will have worse than “average” risks
  - Hence experience will be worse than expected

Principles of Insurance

Question: A leading automobile insurer in the USA used to give out reflective bumper stickers of the company symbol when a policy was taken out. If the local manger saw someone driving recklessly with that decal on his bumper, the license number would be taken down and at renewal time the policy would not be renewed. Is this fair? Fair to whom?

Principles of Insurance

- Random Chance
  - insurance must be based on random chance
  - certainty is the opposite of random chance
  - without random chance there is antiselection
  - losses are predictable in number but not who will claim

Principles of Insurance

- Statistical fluctuations and Accounting Periods
  - insurance is based on long term trends
  - there will always be short term fluctuations
  - accounting periods never match the natural cycle

Principles of Insurance

- Statistical fluctuations and Accounting Periods
  - spikes in experience will distort short term results
  - spikes could bankrupt a company

Principles of Insurance

- Statistical fluctuations and Accounting Periods
  - to deal with spikes
    - set up special reserves
    - reinsure
  - all companies must use reinsurance

Introduction to Non Life Insurance

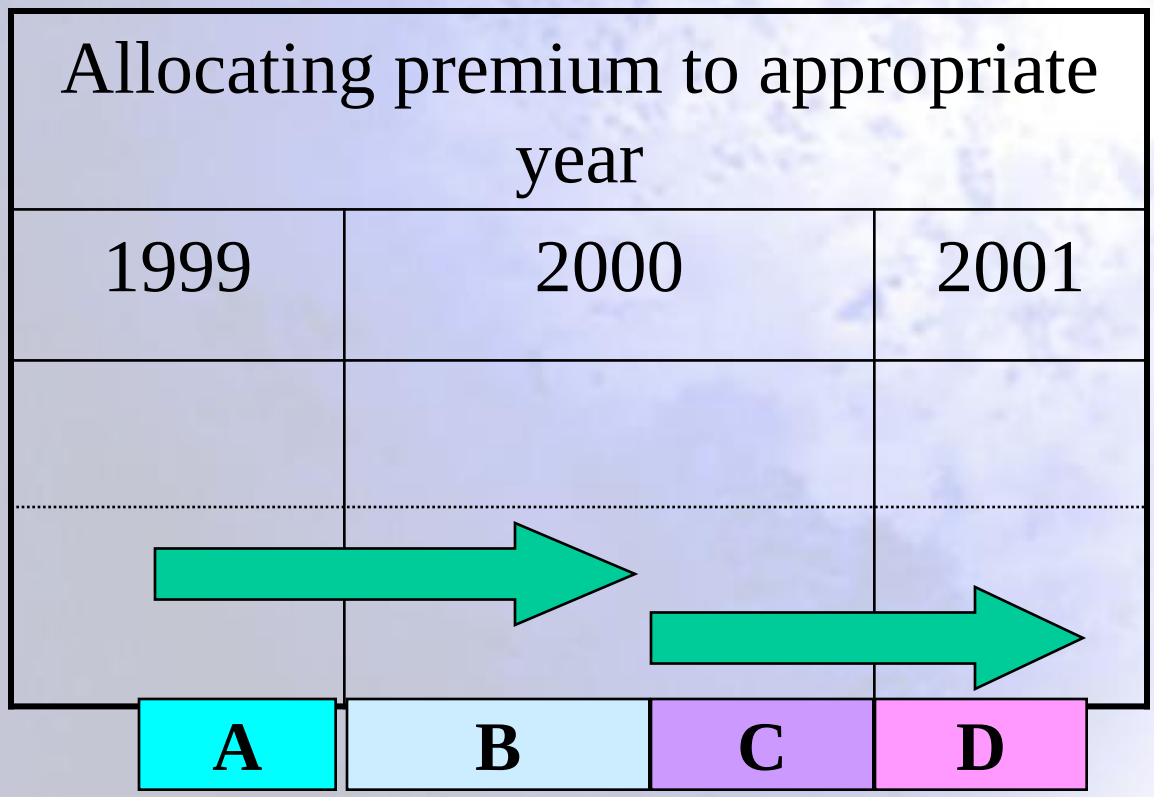
- Non life insurance has many names
  - general insurance
  - short term insurance
  - property & casualty insurance

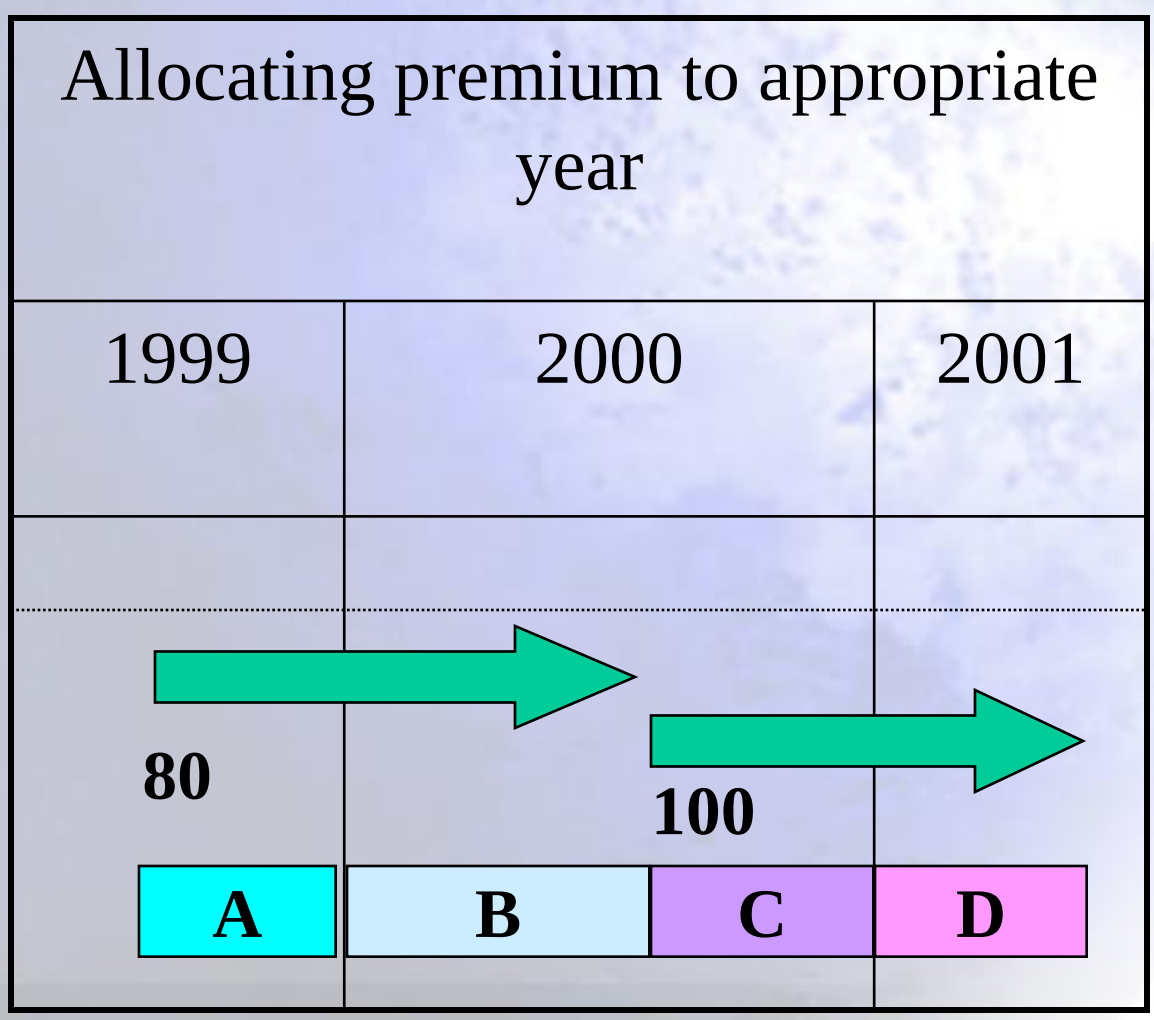
Introduction to Non Life Insurance

- Characteristics of non life insurance
  - one year term
  - flat commissions to agents
  - market share strategy
  - ratios examination

Introduction to Non Life Insurance

- Premiums and the Unearned Premium Reserve
  - written premium
  - equals sales result of the company
  - gross premium minus reinsurance premium equals net premium
  - must put net premium into the correct year


Allocating premium to appropriate year
1999
2000
2001
A
B
C
D


Allocating premium to appropriate year
1999
2000
2001
80
100
A
B
C
D

Introduction to Non Life Insurance

- Unearned premium reserve
  - unearned premium reserve is calculated at the end of the accounting period
  - unearned premium reserve calculated

1 / 12

1 / 24

1 / 365

Introduction to Non Life Insurance

- Earned premium and unearned premium reserve
  - Earned premium equals
    - Net written premium plus
    - unearned premium reserve at beginning of year minus
    - unearned premium at end of year

Introduction to Non Life Insurance

- Unearned premium reserve

– unearned premium reserve is set aside to pay future losses

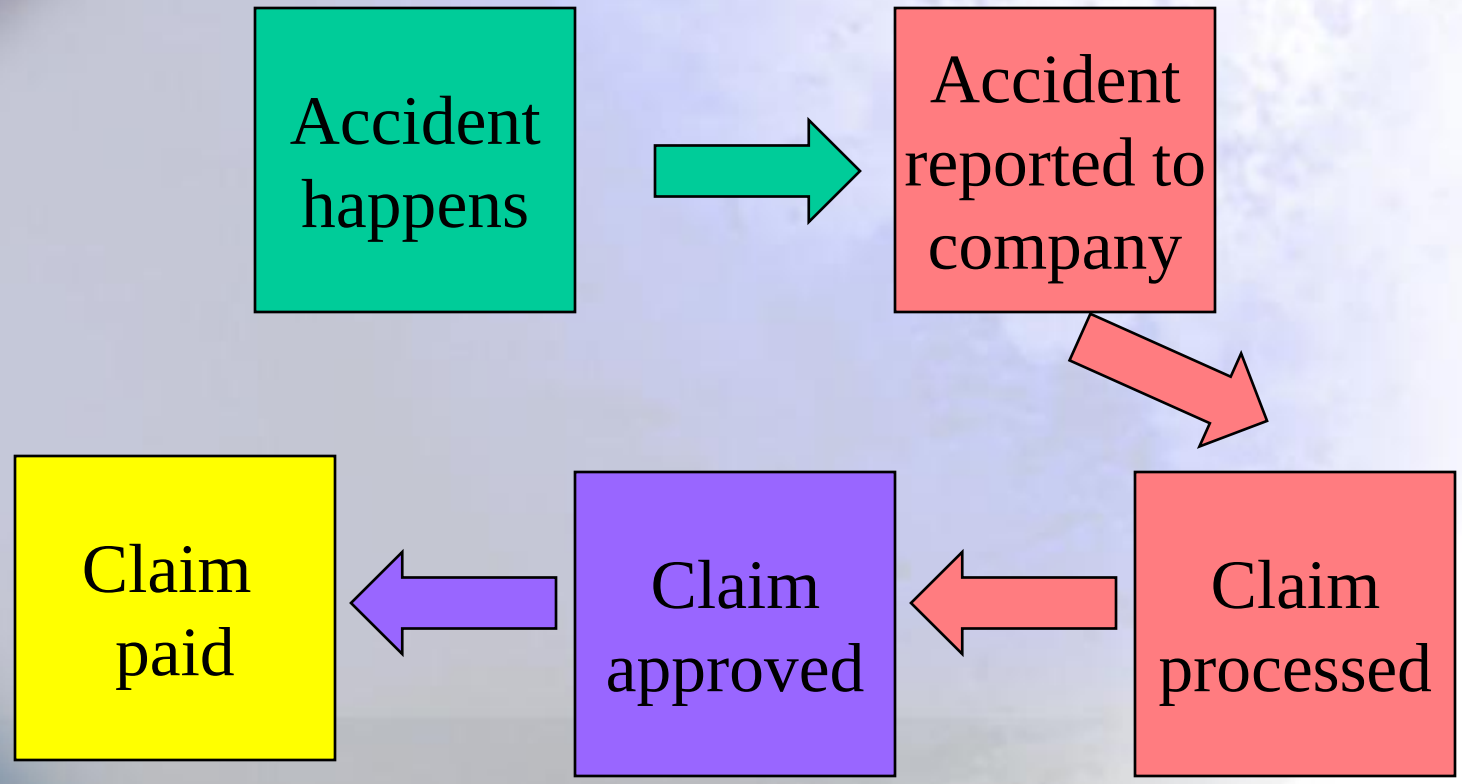
– also called reserve for unexpired risks

Introduction to Non Life Insurance

- Loss reserves
  - the other principal reserve in non life insurance
  - for losses which have already happened

Introduction to Non Life Insurance

- Claims cycle



Introduction to Non Life Insurance

- The claims or loss reserves, based on the claims cycle, are
  - the incurred but not reported reserve (IBNR)
  - reserve for claims in process
  - reserve for claims approved but not yet paid

Introduction to Non Life Insurance

- Incurred But Not Reported Reserve (IBNR)
  - most uncertain reserve
  - hardest to calculate

Introduction to Non Life Insurance

- Sample IBNR calculations
  - Number of claims per day x average size claim
  - Percentage of earned premium
  - Plus events in last part of year

Introduction to Non Life Insurance

- Reserve for claims in process
  - add up reported claims
  - adjust for proper amounts

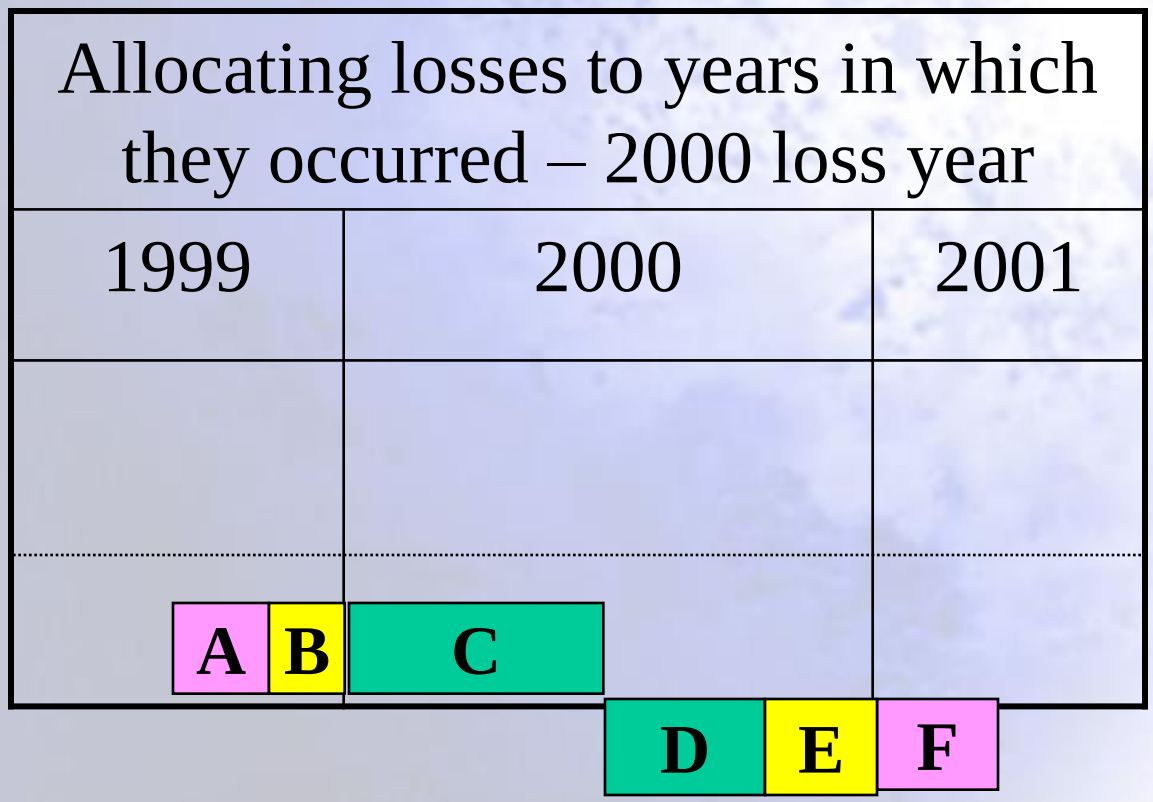
Introduction to Non Life Insurance

- Reserve for claims approved but not paid
  - add up approved claims
  - if unusually high could indicate liquidity problems

Introduction to Non Life Insurance

- Incurred claims
  - accidents which actually happened during the period
  - Business accounting basis

Introduction to Non Life Insurance



Introduction to Non Life Insurance

- Allocating losses to years in which they occurred – 2000 loss year
  - Losses **paid** in 1999 – A
  - Losses **paid** in 2000 – B + C
  - Losses **paid** in 2001 – D + E
  - Losses **incurred** in 2000 – C + D

Introduction to Non Life Insurance

- Incurred claims equals
  - claims paid during the period
  - plus claims reserve at end of year
  - minus claims reserve at beginning of year

Introduction to Non Life Insurance

- Development of loss reserves
  - it takes many years to know what the ultimate losses are for any year

Introduction to Non Life Insurance

- Development of loss reserves
  - table on next slide shows development of estimate of losses year by year for ten years beginning with loss year 1992
  - table prepared after year end 2001

Introduction to Non Life Insurance

	1	2	3	4	5	6	7	8	9	10
1992	80	90	91	89	89	90	88	88	88	88
1993	82	89	89	86	91	92	92	91	88	
1994	82	90	89	94	93	91	92	91		
1995	86	85	89	87	85	87	86			
1996	102	108	107	105	108	102				
1997	97	97	98	95	96					
1998	98	97	99	98						
1999	100	102	101							
2000	102	100								
2001	101									

Introduction to Non Life Insurance

- Claims control an important aspect of profits
  - paying claims is important for business
  - payment of valid claims enhances reputation of business
  - control of invalid or dubious claims protects profits

Introduction to Non Life Insurance

- Ratemaking
  - accounting numbers are best estimates at the time
  - changes are made in the future and not in the past
  - rates are calculated on a business accounting basis
  - actuary will use the most up to date loss figures

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Year	losses reported in annual statement	losses estimated in year 5
1	75	65
2	70	70
3	75	75
4	73	80

Introduction to Non Life Insurance

- Important Ratios
  - loss ratio
  - expense ratio
  - combined ratio

Introduction to Non Life Insurance

- Loss Ratio
  - compares losses to premiums
  - very low number indicates it is calculated incorrectly
  - must use business accounting numbers

Introduction to Non Life Insurance

Loss Ratio

equals

incurred losses

earned premium

Introduction to Non Life Insurance

- Size of loss ratio
  - 60 – 80% for automobile insurance
  - Large number of policies measns predictable results
  - Low loss ratio means bad deal for customers

Introduction to Non Life Insurance

- Size of loss ratio
  - different loss ratio for each line of business
  - some lines more volatile than others
  - need many lines to have predictable results

Introduction to Non Life Insurance

Expense ratio

equals

incurred expenses

written premium

or

incurred expenses

earned premium

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- Combined Ratio
  - equals loss ratio plus expense ratio

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- Combined Ratio
  - often around 100%
  - profits come from investment income
  - assets must be invested

Introduction to Non Life Insurance

- The Balance Sheet

Assets	Liabilities
	capital & surplus

Introduction to Non Life Insurance

- The Balance Sheet
  - Assets
    - only those which can be used to pay claims

Introduction to Non Life Insurance

- The Balance Sheet
  - Liabilities
    - the main liability is reserves
    - liabilities to policy holders

Introduction to Non Life Insurance

- Capital and Surplus
  - the difference between assets and liabilities
  - needed :
    - for unexpected losses (losses greater than reserves)
    - used to expand the company

Introduction to Non Life Insurance

- Capital & surplus
  - composed of capital
    - the amount the shareholder paid in
  - and surplus
    - retained earnings

Introduction to Non Life Insurance

- Leverage
  - using other people's assets to increase your profit
  - In insurance, leverage comes from assuming premiums

Introduction to Non Life Insurance

Leverage

premiums

capital & surplus

Introduction to Non Life Insurance

Leverage

Premium

less than

2 X capital & surplus

Introduction to Non Life Insurance

- How much capital & surplus is needed
  - for a new company
  - for a company already in business

Introduction to Non Life Insurance

- For a new company
  - recommended $3 million
  - sometimes lower in emerging markets

Introduction to Non Life Insurance

- For an existing company
  - must be able to offset adverse deviations
  - depends on size and nature of business

Introduction to Non Life Insurance

- Three approaches for adequate capital & surplus

1. rule of thumb
2. European Union
3. North America/Australia

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- Adequate capital & surplus

1. Rule of thumb
   - capital + surplus = 15% of reserves
   - could be 33% for volatile lines or small companies

Introduction to Non Life Insurance

- European Union formula

2. The larger of (a) and (b):
   - (a) 18% of first €10 million of (gross written premium – 50% of reinsurance premium)+16% of excess of such premium
   - (b) 26% of the first €7 million of rolling average incurred claims + 23% of the excess of such claims

Introduction to Non Life Insurance

- The European Union formula
  - sees risk coming from premiums and from claims.
  - more business (premiums) means deviations could be greater
  - claims are subject to fluctuation

Introduction to Non Life Insurance

3. North American formulas
   - very complex
   - require computers and actuaries
   - recognize risk on both sides of balance sheet

Introduction to Non Life Insurance

- North American formulas
  - recognize that insurance companies manage two books of business
  - assets and liabilities

Introduction to Non Life Insurance

- How much is an insurance company worth?
- Calculated in three ways
  - Rule of thumb
  - Comparison with others
  - Actuarial basis

Introduction to Non Life Insurance

- How much is an insurance company worth?
- Rule of thumb
  - 1.5 x capital & surplus
  - plus 20% of premiums

Introduction to Non Life Insurance

- How much is an insurance company worth?
- Comparison to Others
  - How much did similar companies sell for

Introduction to Non Life Insurance

- How much is an insurance company worth?
- Actuarial basis
  - net worth
  - plus value of future profits

Introduction to Non Life Insurance

- Why companies fail
  - bad reinsurance
  - inadequate pricing
  - rapid growth
  - health insurance
  - dealings with related companies

Introduction to Life Insurance

- Topics covered
  - reasons to buy life insurance
  - different life insurance products
  - main variables
  - life insurance reserves
  - mathematics of life insurance
  - managing the balance sheet

Introduction to Life Insurance

- Topics covered
  - capital and surplus
  - how life insurance companies are valued
  - life insurance accounting
  - why insurance companies fail
  - annuities

Introduction to Life Insurance

- Reasons to buy life insurance
  - funeral expenses
  - pay death taxes
  - business
  - replacement of lost income on death
  - buy-out
  - credit life to pay off loan
  - protection from creditors

Introduction to Life Insurance

- Different life insurance products

Type	Description
Whole life	Payable on death, whenever it occurs
Term	Payable on death within specific period
Group life	Employer sponsored, covers group of employees

Introduction to Life Insurance

- Different life insurance products

Type	Description
Endowment	Payable at maturity or death if earlier
Annuity	Periodic payment until death of annuitant(s)
Disability/ health	Payments on disability or for medical treatment

Introduction to Life Insurance

- Four main variables
  - mortality
  - expenses
  - lapses
  - investment income

Introduction to Life Insurance

- Mortality tables
  - life insurance is based on probability of death and survival
  - mortality statistics come from many sources
    - data collected by government statisticians
    - industry-wide insurance data
    - company specific data

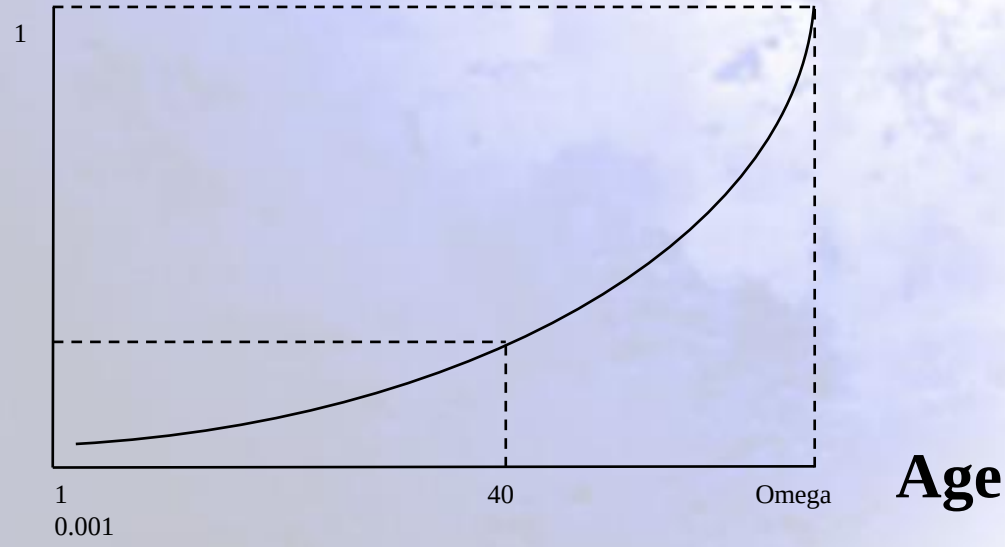
Introduction to Life Insurance

- Mortality tables
  - mortality generally increases as we age
  - peri-natal and infant mortality higher
  - also peak at teen-age and young adult years, especially for males
  - stylized mortality curve shown in next slide

Introduction to Life Insurance

SIMPLIFIED MORTALITY TABLE

Probability Of Death



Introduction to Life Insurance

- Mortality tables
  - there are many different mortality tables
  - mortality varies from country to country
  - also varies within country
    - population mortality
    - “at work” mortality
    - insurance policy mortality
    - annuitant mortality

Introduction to Life Insurance

- Mortality tables
  - mortality has been improving in most countries
  - increase in “omega” - the limit of life
  - “squaring of mortality curve” - fewer premature deaths
  - sometimes mortality deteriorates - many ex-soviet countries

Introduction to Life Insurance

- Sensitivity of mortality rates
  - typically mortality rates are 1 per 1,000 at age 40
  - one extra death represents 100% increase in experience
  - even one extra death in 10,000 people equates to 10% above expected
  - insurance companies protect themselves from anti-selection through underwriting

Introduction to Life Insurance

- Objectives of underwriting
  - underwriting ensures that only standard lives accepted as normal risks
  - additional risks pay extra premium
  - this keeps down cost for everyone
  - some latitude allowed in definition of “standard”

Introduction to Life Insurance

- Factors in underwriting
  - family history
  - health - medical exams
  - amount insured and reasons
  - friends and associates
  - occupation and hobbies

Introduction to Life Insurance

- Factors affecting mortality

Better	Poorer
Women	Men
Wealthy	Poorer
Non-smokers	Smokers
Better educated	Less education

Introduction to Life Insurance

Question: Women live longer than men. They have better mortality at every age from birth to omega. However, in their fifties women exhibit higher levels of disability. Why would they have higher levels of disability than men do at this age?

Introduction to Life Insurance

- Select and ultimate mortality
  - individuals who have just passed medical have better mortality - called “select mortality”
  - also those who have recently purchased annuity - self-selection
  - advantage deteriorates over time - “ultimate mortality”

Introduction to Life Insurance

- Cost of mortality
  - pure premium for one year's insurance simply mortality rate
  - for example at age 40 rate should be $1 for each $1,000 of sum insured
  - assumes mortality = 1 per 1,000

Introduction to Life Insurance

- Level premium life insurance
  - mortality goes up with age
  - on one year basis premium would increase each year
  - eventually premium would be prohibitively expensive
  - level premium avoids this problem

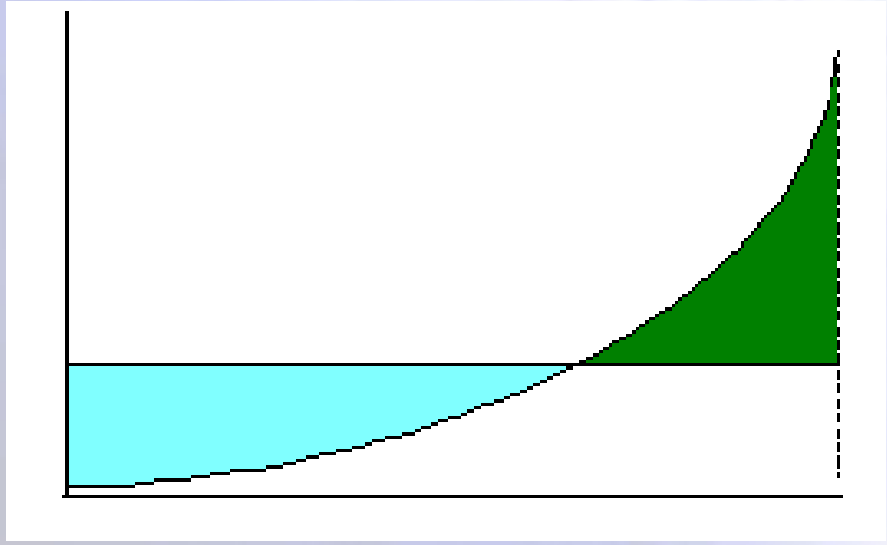
Introduction to Life Insurance

- Level premium life insurance
  - premium starts off greater than cost of mortality
  - additional premium goes into reserve
  - when cost of mortality exceeds premium extra cost paid from reserve
  - reserve also earns interest

Introduction to Life Insurance

- **ILLUSTRATION OF LEVEL PREMIUM LIFE INSURANCE**

Amount of Annual Premium



Level Premium

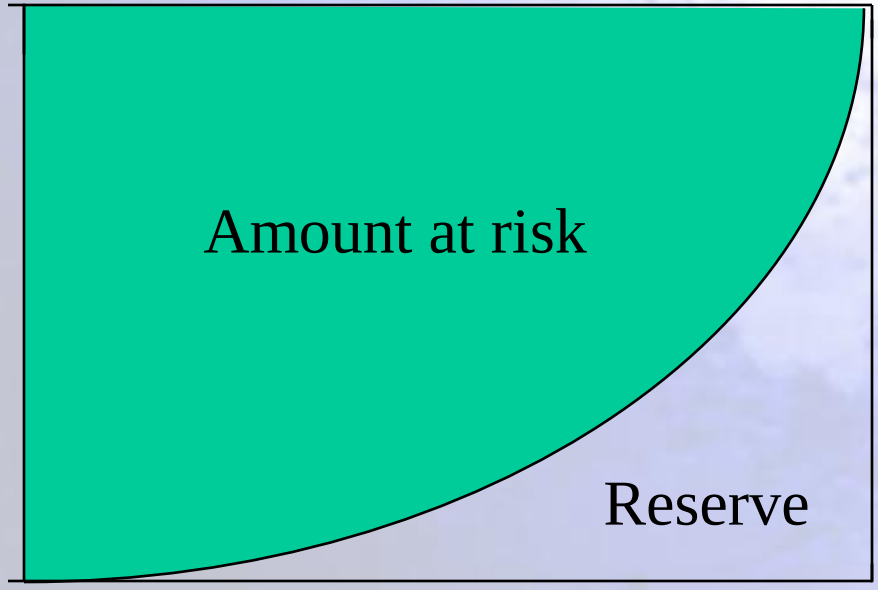
Age

Introduction to Life Insurance

- Build-up of reserve
  - amount at risk = sum insured - reserve
  - reserve increases by interest and reduces by mortality charge and expenses
  - eventually equals sum insured at omega for whole life or maturity for endowment
  - part of reserve could be refunded on cancellation of policy = surrender value

Introduction to Life Insurance

- Build-up of reserve



Introduction to Life Insurance

- A natural hedge
  - life insurance portfolio benefits from improving mortality
  - annuity portfolio suffers from this
  - balanced portfolio of life insurance and annuities will be immune to changing mortality

Introduction to Life Insurance

- Non-participating versus participating
  - in non-participating policy premium is fixed
  - this means company must make assumptions about mortality, interest and expenses over many years into future

Introduction to Life Insurance

- Non-participating versus participating
  - if not sufficiently conservative will make a loss
  - if overly conservative might not be competitive and will sell few policies
  - solution might be participating policy

Introduction to Life Insurance

- Non-participating versus participating
  - in participating policy, conservative assumptions are made to guard against losses - premiums higher than non-par
  - but dividends are returned to policyholder when experience favourable
  - risk and reward shared between company and policyholder

Introduction to Life Insurance

- Non-participating versus participating
  - dividends paid as
    - cash
    - premium reduction
    - increased insurance
  - can be offset to inflation, by increasing cover

Introduction to Life Insurance

- Non-participating versus participating
  - this is more complex product to cost and illustrate
  - also dividend calculations complex
  - requires more actuarial input than other products

Introduction to Life Insurance

- Group life
  - insurance sponsored by employer for employees
  - or else could be for other “affinity groups”, e.g. trade unions, professional associations
  - based on mortality charge each year
  - while rate for each individual goes up, rate for group remains stable

Introduction to Life Insurance

- Expenses
  - expenses can be broken down into
    - initial expenses
    - on-going expenses
    - claims expenses
  - initial expenses include agent's commission and other expenses of issuing policy, including underwriting

Introduction to Life Insurance

- Expenses
  - initial expenses can be very high, since policy is for long term
  - can exceed first year's premium
  - this means there is often "surplus strain", i.e. capital is needed to put new policy on books
  - reserve methods can mitigate this strain

Introduction to Life Insurance

- Expenses
  - on-going expenses, including taxes, need to be assessed carefully
  - will be paid many years into the future to keep policy in force
  - actuary must be aware of inflation and other factors
  - expenses also need to be controlled

Introduction to Life Insurance

- Expenses
  - claims expenses not as important as in non-life insurance
  - claims paid on basis of factual evidence, i.e. death certificate or application for maturity amount
  - claims expenses for disability and health policies much higher, more like non-life

Introduction to Life Insurance

- Lapses
  - companies need policies to stay in force in order to recoup initial expenses
  - lapses or surrenders are important to monitor
  - lapses highest in early years, as high as 15%
  - lapses affect number policies to spread overhead

Introduction to Life Insurance

- Lapses
  - anti-selection - those in poor health least likely to lapse or surrender
  - lapses connected with economic cycle - go up during recessions
  - deduction made from reserve to recoup cost of unamortized expenses on surrender

Introduction to Life Insurance

- Lapses
  - actuaries sometimes discount lapses to reduce cost of premium, e.g. for term policies where there are no surrender values
  - these are called **lapse supported policies**
  - policyholders seldom act against their own interest

Introduction to Life Insurance

- Lapses
  - so lapses generally less than expected
  - these policies seldom successful
  - issue for supervisor - are there any lapse supported policies in portfolio?

Introduction to Life Insurance

- Investment income
  - reserves need to be invested
  - investments should be both high quality and liquid
  - investment of funds can help in country's development
  - but might be challenge in developing country

Introduction to Life Insurance

- Investment income
  - investment regulation follows three possible models
    - prudent person rule
    - schedule of permitted assets, often with maximum or minimum requirements
    - matching of assets and liabilities
  - often combination of some elements of all three

Introduction to Life Insurance

- Investment income
  - in developed countries more technical approaches used (e.g. prudent person and matching)
  - in developing countries expertise may not be available
  - more mechanistic rules often preferred

Introduction to Life Insurance

- Life insurance reserves
  - in principle follow same cycle as for non-life insurance
    - future claims
    - incurred but not reported
    - claims in process
    - approved but not yet paid
  - in practice claims cycle has different emphasis

Introduction to Life Insurance

- Life insurance reserves
  - for permanent insurance (whole life & endowment) claim will be paid eventually
  - claims payment occur many years into future
  - claims are fixed amount, not based on indemnity

Introduction to Life Insurance

- Life insurance reserves
  - therefore “unearned premium” approach not applicable
  - also IBNR and claims in process represent very small proportion of total reserves (maybe 1 to 2%, typically), as claims settled very quickly

Introduction to Life Insurance

- Life insurance reserves
  - reserves for future claims calculated on actuarial basis
  - reserve = present value of expected payments in future minus present value of expected premiums

Introduction to Life Insurance

- Life insurance reserves
  - requires assumptions regarding
    - mortality
    - expenses
    - lapses
    - investment earnings
    - other (e.g. disability, if disability waiver)
  - these could change each year

Introduction to Life Insurance

- Life insurance reserves
  - company said to have **strong reserves** if assumptions are conservative
  - examples of conservative assumptions depend on product
  - for life insurance not assuming mortality improvement is conservative

Introduction to Life Insurance

- Life insurance reserves
  - for annuity business assuming significant mortality improvement is conservative
  - for all types of business assuming lower interest than expected is conservative
  - for some types of business assuming no lapsation might be conservative

Introduction to Life Insurance

- Mathematics of life insurance
- q_x = probability of death during one year at age x
- p_x = probability of survival for one year at age x
- $p_x + q_x = 1$
- ${}_np_x$ = probability of survival for n years at age x

Introduction to Life Insurance

- Mathematics of life insurance
- one year discount factor = v
- $v = 1/(1+i)$
- multi-year discount factor v^n
- $v^n = 1/(1+i)^n$

Introduction to Life Insurance

- Mathematics of life insurance
- single pure premium formula for immediate annuity is
- $a_x = \sum v^n * {}_np_x$
- single pure premium for life insurance
- $A_x = \sum v^n * {}_np_x * q_{x+n}$

Introduction to Life Insurance

- Mathematics of life insurance
- Reserve calculations for single premium insurance policies
- y = valuation age
- $V_y = \Sigma\, v^n * {}_np_y * q_{y+n}$

Introduction to Life Insurance

- Mathematics of life insurance
- for annual premium insurance policies value is single premium value minus future expected premiums
- $V_y = A_y - P_x * a_y$
- P_x = premium at age x, net of expected expenses
- A_y = single premium reserve at age y

Introduction to Life Insurance

- Managing both sides of balance sheet
  - insurance companies must manage both sides of balance sheet
  - both assets and liabilities are based on unknown future events
  - managed on the basis of assumptions, which themselves are changing

Introduction to Life Insurance

- Managing both sides of balance sheet
  - risks can be mitigated by matching expected cash flows
  - technique is called **immunization**
  - simplest form is to ensure **duration** of assets and liabilities equal
  - more sophisticated methods now in use

Introduction to Life Insurance

- Capital and surplus
  - minimum capital and surplus varies from country to country
  - a minimum of $5 million is recommended, given very considerable risks in starting life insurance and annuity company
  - lower in some developing countries, but most are moving to EU/US standards

Introduction to Life Insurance

- Capital and surplus
  - continuing capital and surplus requirements depend on volume of business
  - simple rule of thumb is 5% of liabilities
  - EU rules is approx 4% of reserve plus 0.3% of sum at risk
  - no capital requirement based on assets

Introduction to Life Insurance

- Capital and surplus
  - risk based capital formula has percentages applicable to both assets and liabilities
  - takes into account interaction between assets and liabilities
  - not recommended for developing countries - too complex

Introduction to Life Insurance

- Capital and surplus
  - emerging approach - liquidity based approach
  - for large companies liquidity issues more important than risk management
  - still in formative stage

Introduction to Life Insurance

- Capital and surplus
  - illustration of risk based approach

C1	Asset side risks, eg, bond default
C2	Liability side risks, eg inadequate premiums, insufficient interest
C3	Mismatch risk, eg cash flows out of synch
C4	Other risks, eg business, organizational

Introduction to Life Insurance

- Capital and surplus - assets

Cash	0%
Government bonds	0%
AAA bonds	0.25%
BB bonds	4.0%
Mortgages, residential	2%
Mortgages, commercial	3%
Mortgages, restructured	15%
Stocks, preferred	1%
Stocks, common	15%

Introduction to Life Insurance

- Capital and surplus - liabilities

Mortality risk	
Amount at risk, participating policies	0.10%
Amount at risk, non participating	0.25%
Group insurance	0.20%
Statistical fluctuations	
Total amount in force up to 10 million	1%
Over 10 million	0.75%

Introduction to Life Insurance

- Capital and surplus liabilities

Morbidity risk	
Health policies, annual earned premium	12%
Disability insurance reserves	4%
New claims risk	
Annual earned premiums	12%
Continuing claims risk	
Claims more than a year old	10%

Introduction to Life Insurance

- Capital and surplus - liabilities

Statistical fluctuations	
Capital and surplus requirements	1%
Interest margin pricing risk	
Participating policies reserves	0.5%
Non participating reserves	1%

Introduction to Life Insurance

- Capital and surplus - C3 & C4 risks
  - first line of defence is risk management
  - C3 (mismatch) risk could be allowed for by 5% of life and health reserves
  - C4 (organizational) risk difficult to quantify

Introduction to Life Insurance

- How life insurance companies are valued
  - three main ways
  - rules of thumb, e.g. twice capital and surplus
  - by reference to similar companies
  - actuarial valuation

Introduction to Life Insurance

- How life insurance companies are valued
  - a company is worth:
  - capital and surplus
  - plus value of future profit for existing business
  - plus value of future business

Introduction to Life Insurance

- How life insurance companies are valued
  - existing business - rules of thumb
    - .75 to 1.75 X annual premium or
    - 2% of reserve
  - future business more tricky
    - estimate of annual profit X factor of 10 to 12
    - or look at franchise value (license, sales force, software applications etc)

Introduction to Life Insurance

- Life insurance accounting
  - same as accounting for enterprises in general
  - except for deduction of increase in actuarial reserves when calculating profit
  - premiums enter income when due and paid
  - no splitting between earned and unearned premiums

Introduction to Life Insurance

- Life insurance accounting
  - investment income enters income when due
  - assets now mostly marked to market
  - claims on incurred basis
  - no division between underwriting and investment profits

Introduction to Life Insurance

- Why life insurance companies fail
  - bad assets
    - particularly in affiliated companies, non-arm's length loans
  - liquidity problems
    - over-concentration in one asset class, particularly mortgages and real estate
    - lack of attention to immunization

Introduction to Life Insurance

- Why life insurance companies fail
  - management changes
  - rapid expansion of one line of business
    - frequently health insurance
    - rapid expansion could indicate underpricing
  - moving to new corporate headquarters
  - small companies more likely to fail than big ones

Introduction to Life Insurance

- Life insurance company financial statements - balance sheet

Cash	4	Actuarial reserve	79
Bonds	51	Claims reserves	4
Mortgages	19	Due to reinsurers	1
Real estate	7	accounts payable	1
Stocks	5	Total liabilities	85
Computer	1	Paid in capital	2
Due from reinsurers	3	Surplus	13
Deferred acquisition cost	10	Total equity	15
	100		100

Introduction to Life Insurance

- Life insurance company financial statements - profit and loss

Premiums	18	
Investment income	6	
Total income		24
Claims	7	
Increase in reserves	10	
Expenses	5	
Taxes	1	
Total		23
Profit		1

Introduction to Life Insurance

- Types of annuity

Annuity certain	Payable for fixed period
Life annuity	Payable during lifetime of annuitant
Joint annuity	Payable during lifetimes of two or more annuitants

Introduction to Life Insurance

- Types of annuities

Life annuity with guarantee period	Life annuity payable for n years, then for life
Increasing annuity	Fixed annual increase or indexed to CPI

Introduction to Life Insurance

- Types of annuities

Immediate annuity	Payments start right away
Deferred annuity	Payments start at some future date

Reinsurance

- Topics covered
  - Introduction
  - different types of treaty
  - reinsurer's role in establishing new companies
  - reinsurance arrangement
  - financial or finite reinsurance

Reinsurance

- All companies use reinsurance to help pay large claims
- Retention limit
- Treaty versus contract

Question:

- Some World Bank consultants' reports will note that the companies in a developing country reinsure all their business. The consultant will then go into a tirade about how he has discovered that the companies are keeping only a small part of the risk and are therefore similar to brokers selling for the reinsurers.
- What should your response be?

Two types of Reinsurance

- Facultative Reinsurance
- Treaty or Automatic Reinsurance

Conditions Attached to Treaty Reinsurance

- Ceder keeps the risk up to a stated amount
- Ceder does not reinsure his retention elsewhere
- Reinsurance applies to a specific policy form and ratebook
- Underwriting standards
- Source of business
- Location of business

Treaty Indicates Confidence in The Ceder

- All reinsurance subject to audit
- Role of a lead reinsurer

Different Types of Reinsurance Treaties

Non-Life Reinsurance

- Excess Reinsurance (in excess of X)
- Proportional Reinsurance (Y% of the Risk)

Dividing the Risk Between Companies A to F by Reinsurance

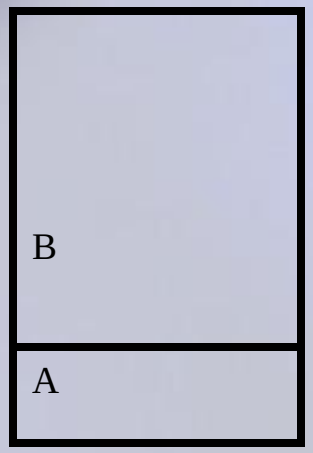


Chart 1

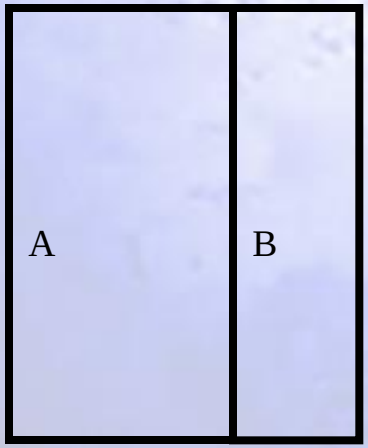


Chart 2

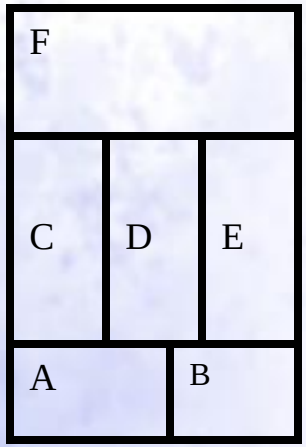


Chart 3

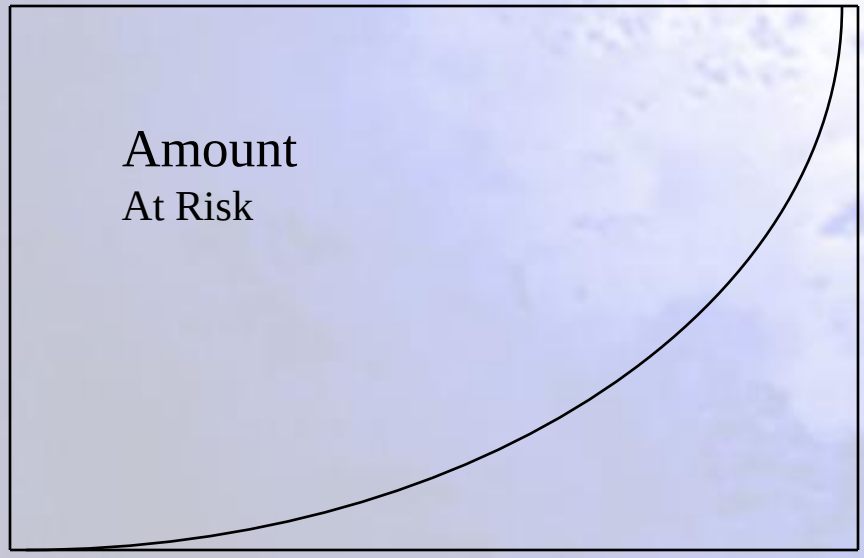
Other Treaty Types

- Catastrophe Reinsurance
- Stop Loss Reinsurance
- Spread Loss Reinsurance
- Financial or Finite Reinsurance

Non-Life Companies are Dependent on Reinsurance

- The Principal Reason non-life companies fail is bad reinsurance.

Life Insurance Yearly Renewable Term (YRT)



The last year, x is equal to omega minus age at issue

Mini Case:

Reinsurers Protecting Themselves

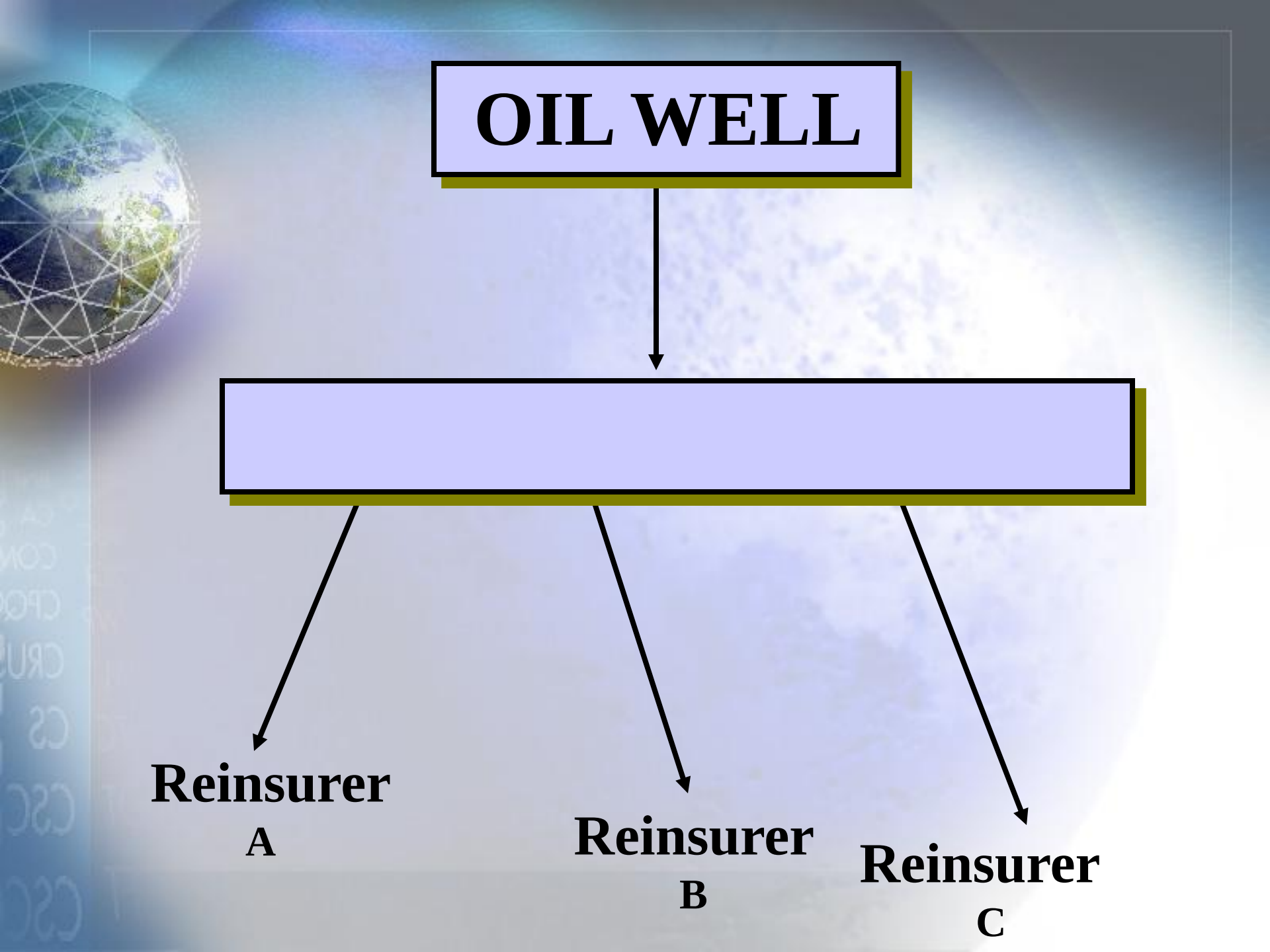
When an insurance company is asked if it can insure a new risk, the first question it will ask itself is, “How can we protect ourselves?” What is it they are protecting against and how do they do that?

Reinsurer's Role in Establishing New Companies

- Provide policies, rates and technologies
- Impose discipline when regulators do not
- Technology transfer without partner owning the company

Reinsurance Arrangements

- Pools: Third party administered company
- Pools set up by the Insured
- Agent owned captives
- Captives


OIL WELL
Reinsurer
A
Reinsurer
B
Reinsurer
C

AGENT

↓

INSURANCE COMPANY

↓

AGENT OWNED CAPTIVE

Offshore Reinsurance: Captives

- Access to Reinsurance
- Avoid Commissions
- Only their Own Risks in the Pool
- Reporting Requirements
- Reserving Requirements
- Marketing of Sophisticated Products
- Tax Advantages? Perhaps

Fronting

- Regulator's Perspective
- Insurer's Perspective

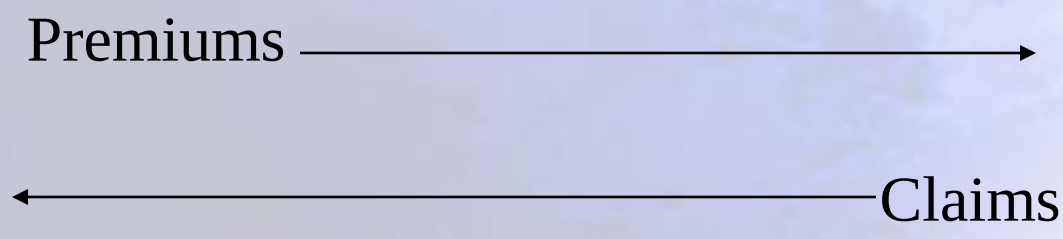
Tax Treaties

- Reinsurance follows the path laid out by tax treaties between nations.

Each item
can be defined
in many ways

Reinsurance Treaty

Company 1 *Cedes Business to* **Company 2**



Reinsurance Agreement

Company 1 *Cedes Business to* **Company 2**

- *Initial Premium of Reserve transfer* →
- *Annual Premium* →
- *Investment Income* →
- *Risk Charge* →

← • *Commission Allowance*
← • *Expense Allowance*
← • *Claims*
← • *Reserve Increase*

← • *Profit Commission or Experience Rating Refund*

3 Sets of Figures

- Getting Started
- Annual Events
- End the Treaty

Financial or Finite Reinsurance

- Done primarily to achieve financial result
- Work backwards to achieve financial effect
- Each company is different
- No other industry can do this
- Must be actuarially correct

Effects are not necessarily complementary

- Different reserving assumptions
- Numbers are functions of other numbers in the statements
- Different accounting rules
- Unequal transfers of assets and liabilities
- Leverage in crossing borders
- Tax, statutory and GAAP statements use different rules

Some Applications of Financial Reinsurance

- Sales Capacity = Capital Capacity
- Manage cash flows
- Tax planning
- Expanding investment class restrictions
- Improved ability to set up reserves
- Optimal use of capital

Prudential regulation

- Topics covered
  - Introduction
  - regulatory objectives
  - reliance on others
  - source of authority
  - risk based supervision
  - performance measures
  - functions of regulator

Prudential regulation

- Introduction
  - section based on Canadian approach
  - judged to be “best international practice”
  - cost of supervision borne by industry
    - insurance companies - around 1% of premium
    - deposit taking institutions - based on assets
  - Superintendent appointed for a 7 year term
    - free of political influence

Prudential regulation

- Regulatory objectives

Main objectives	Balanced by
Prevent undue loss to policyholders	Encourage competition in market place
Maintain confidence in financial system	Provide cost effective service

Prudential regulation

- Reliance on others
  - objective is to provide cost-effective service
  - software packages
  - appointed actuary
  - meetings with external auditors

Prudential regulation

- Reliance on others
  - reliance on reports of actuary and internal auditors
  - checking working papers and systems
  - review Board minutes
  - meeting with Board

Prudential regulation

- Source of authority

Insurance Act	Passed by Parliament
Regulations	Promulgated by government
Guidelines	Issued by regulator

Prudential regulation

- Source of authority
  - law has 10 year “sunset clause”
  - obliges government to review and update legislation at least once every 10 years
  - interested parties in industry given opportunity to comment on statutory instruments

Prudential regulation

- Source of authority
  - often phase in provisions for strengthened requirements, e.g. increase to minimum capital and surplus
  - legislation gives Superintendent authority to move in quickly in problem situation

Prudential regulation

- Why companies fail

Life insurance companies	Bad assets
Non-life companies	Bad reinsurance

Prudential regulation

- Risk based supervision
  - risk based supervision possible when regulator can rely on others
  - contrast to compliance based supervision
  - focus is on
    - internal controls
    - concentration of risks
    - fluctuations
    - ability to withstand adverse deviation

Prudential regulation

- Risk based supervision
  - banking supervision - CAMELS
  - insurance supervision - CARAMELS
  - what does this mean?

Prudential regulation

C	**capital**
A	**assets**
R	**reinsurance**
A	**actuarial reserves**
M	**management**
E	**earnings**
L	**liquidity**
S	**subsidiaries**

Prudential regulation

- Risk based supervision - capital
  - level relative to
    - minimum
    - peers
  - source
  - composition
  - trends

Prudential regulation

- Risk based supervision - assets
  - composition
  - changes in the composition
  - ratings of the different securities
  - the risk of default
  - prudent person rule
  - underwriting strength of the company's investment personnel

Prudential regulation

- Risk based supervision - reinsurance
  - strength of reinsurers
  - location of reinsurers
  - liquidity in reinsurance treaties
  - risks covered by reinsurance treaties
  - exposure at upper limits
  - exposure to tails

Prudential regulation

- Risk based supervision - reinsurance
  - retention limits
  - amount and percentage ceded to unregistered reinsurers
  - security of any reinsurance trust (probably require 110% of market value)

Prudential regulation

- Risk based supervision - reinsurance
  - reinsurance not in the ordinary course of business
  - new reinsurance on old blocks of business

Prudential regulation

- Risk based supervision - actuarial reserves
  - accuracy of the data on the system
  - accuracy and the appropriateness of the computer codes
  - correct classification of the liability
  - valuation assumptions

Prudential regulation

- Risk based supervision - actuarial reserves
  - claims liability
  - incurred but not reported (IBNR) calculations

Prudential regulation

- Risk based supervision - management
  - succession planning
  - compensation plans e.g. do they pay bonuses based on volume of production rather than profitability
  - is loyalty to the company or to the owners
  - rotation of management

Prudential regulation

- Risk based supervision - management
  - to whom does the internal auditor report
  - depth of management
  - Board of Directors
    - are there members who understand the different issues?
    - do minutes reflect what is happening in the company?
    - are any criminals involved?

Prudential regulation

- Risk based supervision - earnings
  - diversification of earnings by product and by territory
  - source of earnings
  - trend in earnings
  - stability of earnings, sustainability of earnings, marketing plan

Prudential regulation

- Risk based supervision - earnings
  - experience in meeting corporate goals especially if the plan has capital intensive products

Prudential regulation

- Risk based supervision - liquidity
  - what amount of cash and near cash does the company have in relation to its assets and reserves
  - what assets are not liquid
  - what assets are liquid within a short period of time but subject to market fluctuations

Prudential regulation

- Risk based supervision - liquidity
  - what is the relation of cash flow in to cash flow out
  - could the company withstand a run

Prudential regulation

- Risk based supervision - subsidiaries
  - are transfers to subsidiaries approved by the Board of Directors?
  - how much money flows to subsidiaries and for what reasons? what values are shown for the subsidiaries on the balance sheet?
  - are controls in place that would prevent transfers to the subsidiaries that would impair the capital of the company

Prudential regulation

- Performance measures
  - work is underway to measure regulator's own performance
  - work in progress, some measures more advanced than others
  - involve opinion polls and third party evaluations

Prudential regulation

- Performance measures
- preventing undue loss to consumers
  - how many cents on dollar recovered from insolvent institutions?
  - Company ratings - 0 to 4
    - percentage at each risk level
    - movements between risk level
    - quantification of failure at each level

Prudential regulation

- Performance measures
- preventing undue loss to consumers
  - accuracy of regulator's predictions
  - company strategy for reducing risk level
  - measurement of results achieved

Prudential regulation

- Performance measures
- maintaining public confidence
  - survey of external rating
  - polling of general public
  - polling of senior executives in insurance industry

Prudential regulation

- Performance measures
- quality of supervisory service (under development)
  - Percent of staff meeting specified levels of competence and education
  - response to requests outside the normal supervisory functions
  - quality of internal services compared to industrial standards

Prudential regulation

- Performance measures
- competition (under development)
  - measures to determine effect of supervision on competition being developed

Prudential regulation

- Performance measures
- cost effectiveness (under development)
  - comparison with other institutions and jurisdictions

Prudential regulation

- Functions of regulator
  - regulator has limited resources
  - cannot always do everything it wants to
  - no advanced filing of policies and premiums in Canada

Prudential regulation

- Functions of regulator
  - regulator does not check compliance
  - if mandatory provisions missing, law deems them to be present
  - more effective use of regulatory resources

Prudential regulation

- Functions of regulator
  - in one jurisdiction 90% of time was spent checking agent licensing
  - but there was no licensing examination!
  - time could be freed up for more useful pursuits

Review through financial ratios

- Early warning tests - what do they mean?
  - Tests have shown to be important
  - values outside range correlated with developing financial problems

Review through financial ratios

- Early warning tests
  - ratios are **flags** that warrant further investigation
  - few ratios outside normal range does not necessarily signal a problem
  - on the other hand, deterioration of ratios, even within normal range, may be worrying sign

Review through financial ratios

- Early warning tests
  - indicators are probably poorer in developing countries than in developed ones
  - need to calibrate ratios for this market
  - gives companies benchmarks to work towards to ensure financial health

Review through financial ratios

- 13 tests are shown
- tests 1 to 8 are for life insurance companies
- tests 1 to 7 and 9 to 13 are for non-life companies

Review through financial ratios

Test number	Name of test	Definition	Usual range
1a	Net insurance ratio	Net premiums written/(capital + surplus)	Up to 3X
1b	Gross insurance ratio	Gross premiums written/(capital + surplus)	Up to 7X
2	Change in net premium	Change in net premiums written	-33% to +33%
3	Change in surplus	Increase/decrease in capital + surplus	-10% to +50%

Review through financial ratios

Test number	Name of test	Definition	Usual range
4	Earnings ratio	Net income/capital and surplus	-3 to 20%
5	Surplus relief	Commission and allowances from reinsurers/capital & surplus	Up to 20%
6	Solvency ratio	(capital + surplus)/(total liabilities)	Minimum life – 4.5% Non-life – 15%

Review through financial ratios

Test number	Name of test	Definition	Usual range
7	Investment in real estate and subs	Investment in real estate and subs /(capital + surplus)	Up to 60%
8	Default ratio on mortgages	Mortgages in default/(capital + surplus)	Up to 6%
9	Loss ratio	Losses incurred/earned premiums	50 – 80%
10	Expense ratio	Expenses/earned premiums	20 – 35%

Review through financial ratios

Test number	Name of test	Definition	Usual range
11	Combined ratio	Loss ratio + expense ratio	80 – 100%
12	Amounts due from agents and subs	Amount due/capital and surplus	Up to 50%
13	Liquidity	Liquid Assets/Claims reserves plus unearned premium reserves	Around 100%