# FN241: Session 1
# Introduction to Risk Management and Insurance

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# Outline

- Insurance vs. Finance
- Risk in Our Society
- Insurance and Risk

# Insurance vs. Finance

# Actuarial Science Meets Financial Economics

Buhlmann's classifications of actuaries

- Actuaries of the first kind - Life
  - Deterministic calculations
- Actuaries of the second kind - Casualty
  - Probabilistic methods
- Actuaries of the third kind - Financial
  - Stochastic processes

# Similarities

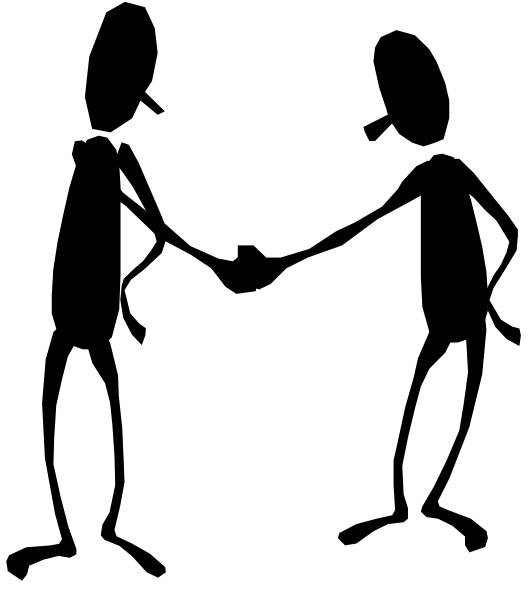
**Both Actuaries and Financial Economists:**

Are mathematically inclined

Address monetary issues

Incorporate risk into calculations

Use specialized languages



# Different Approaches

Risk

Interest Rates

Profitability

Valuation

## Risk

### Insurance

- Pure risk - Loss/No loss situations
- Law of large numbers

### Finance

- Speculative risk - Includes chance of gain
- Portfolio risk

## Interest Rates

### Insurance

- One dimensional value
- Constant
- Conservative

### Finance

- Multiple dimensions
- Market versus historical
- Stochastic

## Profitability

### Insurance

- Profit margin on sales
- Worse yet - underwriting profit margin that ignores investment income

### Finance

- Rate of return on investment

## Valuation

### Insurance

- Statutory value
  - Amortized values for bonds
  - Ignores time value of money on loss reserves

### Finance

- Market value
- Difficulty in valuing non-traded items

# Risk in Our Society

# Key concept ...

- Meaning of Risk
- Chance of Loss
- Peril and Hazard
- Basic Categories of Risk
- Types of Pure Risk
- Methods of Handling Risk

# Meaning of Risk

- **Risk:** Uncertainty concerning the occurrence of a loss
- **Objective Risk vs. Subjective Risk**
  - **Objective risk** is defined as the relative variation of actual loss from expected loss
    - It can be statistically calculated using a measure of dispersion, such as the standard deviation
  - **Subjective risk** is defined as uncertainty based on a person's mental condition or state of mind
    - Two persons in the same situation may have different perceptions of risk
    - High subjective risk often results in conservative behavior

# Chance of Loss

- **Chance of loss:** The probability that an event will occur
- **Objective Probability vs. Subjective Probability**
  - Objective probability refers to the long-run relative frequency of an event assuming an infinite number of observations and no change in the underlying conditions
    - It can be determined by deductive or inductive reasoning
  - Subjective probability is the individual's personal estimate of the chance of loss
    - A person's perception of the chance of loss may differ from the objective probability

# Peril and Hazard

- A **peril** is defined as the cause of the loss
  - In an auto accident, the collision is the peril
- A **hazard** is a condition that increases the chance of loss
  - Physical hazards are physical conditions that increase the chance of loss (icy roads, defective wiring)
  - Moral hazard is dishonesty or character defects in an individual, that increase the chance of loss (faking accidents, inflating claim amounts)
  - Morale Hazard is carelessness or indifference to a loss because of the existence of insurance (leaving keys in an unlocked car)
  - Legal Hazard refers to characteristics of the legal system or regulatory environment that increase the chance of loss (large damage awards in liability lawsuits)

# Basic Categories of Risk

- **Pure and Speculative Risk**
  - A pure risk is one in which there are only the possibilities of loss or no loss (earthquake)
  - A speculative risk is one in which both profit or loss are possible (gambling)
- **Fundamental and Particular Risk**
  - A fundamental risk affects the entire economy or large numbers of persons or groups (hurricane)
  - A particular risk affects only the individual (car theft)
- **Enterprise Risk**
  - Enterprise risk encompasses all major risks faced by a business firm, which include: pure risk, speculative risk, strategic risk, operational risk, and financial risk

# Example: The 10 Most Costly Hurricanes in the United States ($ millions)

| | | | | Estimated insured loss[a] | |
|---|---|---|---|---|---|
| Rank | Date | Location | Hurricane | Dollars When Occurred | In 2005 Dollars[b] |
| 1 | Aug. 25–29, 2005 | AL, FL, GA, LA, MS, TN | Katrina | $40,600 | $40,600 |
| 2 | Aug. 23–24, 25–26, 1992 | FL, LA, MS | Andrew | 15,500 | 21,576 |
| 3 | Oct. 24, 2005 | FL | Wilma | 10,300 | 10,300 |
| 4 | Aug. 13–15, 2004 | FL, NC, SC | Charley | 7,475 | 7,728 |
| 5 | Sep. 16–21, 2004 | AL, FL, GA, OH, PA, NY, NC, 8 other states | Ivan | 7,110 | 7,351 |
| 6 | Sep. 17–18, 21–22, 1989 | U.S. Virgin Islands, PR, GA, SC, NC, VA | Hugo | 4,195 | 6,607 |
| 7 | Sep. 20–26, 2005 | AL, AR, FL, LA, MS, TN, TX | Rita | 5,000 | 5,000 |
| 8 | Sep. 5, 2004 | FL, GA, SC, NC, NY | Frances | 4,595 | 4,751 |
| 9 | Sep. 15–25, 2004 | PR, FL, PA, GA, SC, NY | Jeanne | 3,440 | 3,557 |
| 10 | Sep. 21–28, 1998 | PR, U.S. Virgin Islands, AL, FL, LA, MS | Georges | 2,900 | 3,475 |

[a]Property coverage only.
[b]Adjusted to 2005 dollars by the Insurance Information Institute.

SOURCE: ISO; Insurance Information Institute, *Insurance Factbook*.

# Types of Pure Risks

- **Personal risks** involve the possibility of a loss or reduction in income, extra expenses or depletion of financial assets:
  - Premature death of family head
  - Insufficient income during retirement
    - Most workers are not saving enough for a comfortable retirement
  - Poor health (catastrophic medical bills and loss of earned income)
  - Involuntary unemployment

# Example: Reported Total Savings and Investments among Those Responding, by Age

(not including value of primary residence or defined benefit plans)

| | Worker Age Group | | | | | |
|---|---|---|---|---|---|---|
| | **All Workers** | **Ages 25–34** | **Ages 35–44** | **Ages 45–54** | **Ages 55+** | **All Retirees** |
| Less than $10,000 | 39% | 54% | 34% | 31% | 36% | 30% |
| $10,000–$24,999 | 14 | 19 | 15 | 13 | 6 | 12 |
| $25,000–$49,999 | 12 | 11 | 14 | 14 | 8 | 14 |
| $50,000–$99,999 | 12 | 7 | 16 | 12 | 12 | 11 |
| $100,000–$149,999 | 5 | 1 | 7 | 5 | 7 | 7 |
| $150,000–$249,999 | 6 | 3 | 5 | 10 | 5 | 6 |
| $250,000–$499,999 | 6 | 1 | 5 | 8 | 13 | 12 |
| $500,000 or more | 6 | 4 | 4 | 8 | 13 | 10 |

SOURCE: Employee Benefit Research Institute, "Will More of Us Be Working Forever? The 2006 Confidence Survey," *EBRI Issue Brief, No. 292,* Figure 3, April 2006.

# Types of Pure Risks

- **Property risks** involve the possibility of losses associated with the destruction or theft of property:
  - Physical damage to home and personal property from fire, tornado, vandalism, or other causes
- **Direct loss vs. indirect loss**
  - A direct loss is a financial loss that results from the physical damage, destruction, or theft of the property, such as fire damage to a restaurant
  - An indirect loss results indirectly from the occurrence of a direct physical damage or theft loss, such as lost profits due to inability to operate after a fire

# Types of Pure Risks

- **Liability risks** involve the possibility of being held liable for bodily injury or property damage to someone else
  - There is no maximum upper limit with respect to the amount of the loss
  - A lien can be placed on your income and financial assets
  - Defense costs can be enormous

# Insurance and Risk

# Key concept …

- Definition and Basic Characteristics of Insurance
- Requirements of an Insurable Risk
- Insurance vs. Gambling
- Insurance vs. Hedging
- Types of Insurance

# Definition of Insurance

**Insurance** is the **pooling** of **fortuitous losses** by transfer of such risks to insurers, who agree to **indemnify** insureds for such losses, to provide other pecuniary benefits on their occurrence, or to render services connected with the risk

# Basic Characteristics of Insurance

- **Pooling of losses**
  - Spreading losses incurred by the few over the entire group
  - Risk reduction based on the Law of Large Numbers
- **Payment of fortuitous losses**
  - Insurance pays for losses that are unforeseen, unexpected, and occur as a result of chance
- **Risk transfer**
  - A pure risk is transferred from the insured to the insurer, who typically is in a stronger financial position
- **Indemnification**
  - The insured is restored to his or her approximate financial position prior to the occurrence of the loss

# Requirements of an Insurable Risk

## 1) Large number of exposure units

- to predict average loss

## 2) Accidental and unintentional loss

- to control moral hazard
- to assure randomness

## 3) Determinable and measurable loss

- to facilitate loss adjustment
  - insurer must be able to determine if the loss is covered and if so, how much should be paid.

# Requirements of an Insurable Risk

## 4) No catastrophic loss

- to allow the pooling technique to work
- exposures to catastrophic loss can be managed by:
  - dispersing coverage over a large geographic area
  - using reinsurance
  - catastrophe bonds

## 5) Calculable chance of loss

- to establish an adequate premium

# Requirements of an Insurable Risk

## 6) Economically feasible premium

- so people can afford to buy
- Premium must be substantially less than the face value of the policy

**Based on these requirements:**

- Most personal, property and liability risks can be insured
- Market risks, financial risks, production risks and political risks are difficult to insure

# Example: Risk of Fire as an Insurable Risk

| *Requirements* | *Does the risk of fire satisfy the requirements?* |
|---|---|
| 1. Large number of exposure units | |
| 2. Accidental and unintentional loss | |
| 3. Determinable and measurable loss | |
| 4. No catastrophic loss | |
| 5. Calculable chance of loss | |
| 6. Economically feasible premium | |

# Example: Risk of Unemployment as an Insurable Risk

| *Requirements* | *Does the risk of unemployment satisfy the requirements?* |
|---|---|
| 1. Large number of exposure units | |
| 2. Accidental and unintentional loss | |
| 3. Determinable and measurable loss | |
| 4. No catastrophic loss | |
| 5. Calculable chance of loss | |
| 6. Economically feasible premium | |

# Adverse Selection and Insurance

- Adverse selection is the tendency of persons with a higher-than-average chance of loss to seek insurance at standard rates
- If not controlled, adverse selection result in higher-than-expected loss levels
- Adverse selection can be controlled by:
  - careful underwriting (selection and classification of applicants for insurance)
  - policy provisions (e.g., suicide clause in life insurance)

# Insurance vs. Gambling

## Insurance

- Insurance is a technique for handing an already existing pure risk
- Insurance is socially productive:
  - both parties have a common interest in the prevention of a loss

## Gambling

- Gambling creates a new speculative risk
- Gambling is not socially productive
  - The winner's gain comes at the expense of the loser

# Insurance vs. Hedging

## Insurance

- Risk is transferred by a contract
- Insurance involves the transfer of insurable risks
- Insurance can reduce the objective risk of an insurer through the Law of Large Numbers

## Hedging

- Risk is transferred by a contract
- Hedging involves  risks that are typically uninsurable
- Hedging does not result in reduced risk

# Types of Insurance

- Private Insurance
  - Life and Health
  - Property and Liability
- Government Insurance
  - Social Insurance
  - Other Government Insurance

**Example:** **Several types of risk are present in the American economy. For each of the following, identify the type of risk that is present. Explain your answer.**

1) The Department of Homeland Security alerts the nation of a possible attack by terrorists.
2) A house may be severely damaged in a fire.
3) A family head may be totally disabled in a plant explosion.
4) An investor purchases 100 shares of Microsoft stock.
5) A river that periodically overflows may cause substantial property damage to thousands of homes in the floodplain.
6) Home buyers may be faced with higher mortgage payments if the Federal Reserve raises interest rates at its next meeting.
7) A worker on vacation plays the slot machines in a casino.

# Question?