

# **Pricing in an RBC Environment**

**(With particular application to Singapore and Malaysia)**

**Matthew Maguire**  
**FSAS**

**SAS General Insurance**

**“A Firm Foundation for Taking Risk”**

**Singapore, 6<sup>th</sup>/7<sup>th</sup> May 2009**



# Table of Contents

---

## Introduction

Overall Premium Level

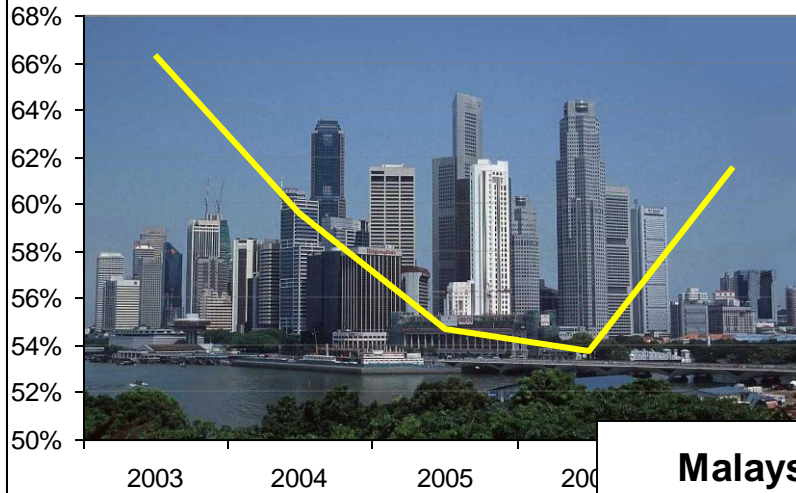
RBC Considerations

Risk Factors and loadings

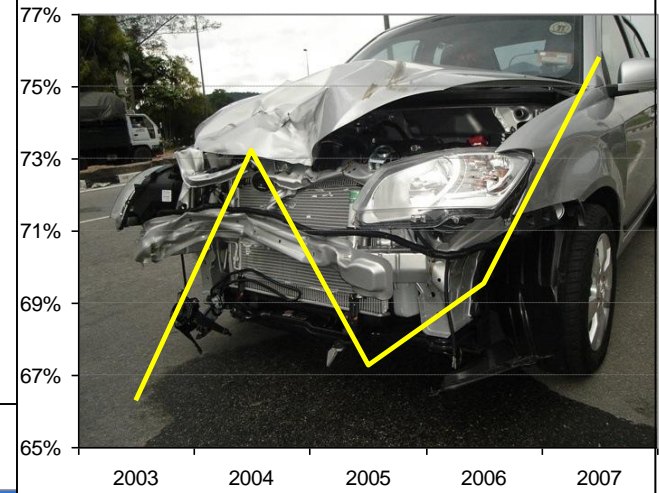
Conclusion

# Summary

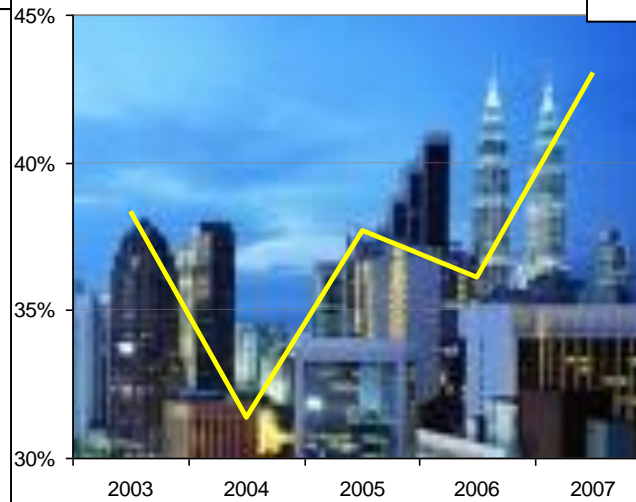
### Singapore - Direct Insurers



### Malaysia - Motor Loss Ratio



### Malaysia - Fire Loss Ratio



# Summary

---

- Pricing is a fundamental part of the insurance concept
- Often seen as the “Sexy” side of actuarial work
- However, needs to be built up from the reserving analysis
- 2 main aspects to consider:
  - Target profitability for the class of business
  - Loadings and Discounts for individual risks
- Introduction of RBC should have an impact on the premium setting process

# Table of Contents

---

Introduction

## **Overall Premium Level**

RBC Considerations

Risk Factors and loadings

Conclusion

# Pricing Models

---

- Tariff - Regulator
- Qualitative - Art & Science
- Cost Plus - Actuarial
- Distribution - Cost vs Price

# Cost Plus Premium Components

---

- Claims
- Expenses
- Profit
  
- Taxes, Commissions, Reinsurance etc
  
- Premium formula becomes:

$$\begin{aligned} \text{Premium} &= \text{Expected Net Claims} \\ &+ \text{Expenses (incl. tax etc)} \\ &+ \text{Profit} \end{aligned}$$

# Premium Components: Claims

---

- Requires an estimate of the claims to be paid
  - This generally requires a detailed reserving analysis
- Ideally would also include the timing of the payments – Discounted Value
  - Allows for returns to be earned on premiums before payment of claims
  - During the 90's this was a “hot topic” for insurers
  - Some companies still have this as a primary focus, though most are more conservative



# Premium Components: Claims

---

## Example:

- Expected Claim Frequency = 8%
- Expected Claim Size = \$1,000
- Expect to pay \$80...
- ... in 5 years time
- Expect to earn 5% investment return per year

Current Value of expected claims is \$62.68

# Premium Components: Expenses

---

- Several forms of expenses need to be considered
  - Business Acquisition Expenses
    - eg Commissions, Branch expenses etc
  - Claims handling expenses
    - eg Claims staff, Legal expenses etc
  - Management Expenses
    - eg General expenses, management overheads etc
- Timing of expenses can differ

# Premium Components: Expenses

---

## Example

Type	Value	Timing	Disc Value
• Acquisition Costs	\$15	Immediate	\$15.00
• Management	\$5	1 <sup>st</sup> Year	\$4.76
• Claims Handling	\$5	5 <sup>th</sup> Year	\$3.92

Current Value of expenses is \$23.68

# Premium Components: Profit

---

- Companies write insurance with the intention of making a profit
- How to determine how much profit is required
- Lots of papers written in the US during the early 1990s
- Profit requirements are usually set in relation to the capital required to run the business

# Premium Components: Profit

---

- Companies need to hold capital to support the business
  - Not just a regulatory requirement
  - Also good business practice
    - Future cash flows are uncertain
    - Insolvency leads to additional costs and so reduces efficiency
    - Improved probability of recovery leads to improved customer confidence
- Investors require a return on capital provided
  - Capital is not in unlimited supply
  - Therefore there is a cost

# Premium Components: Profit

---

- Capital is often expressed as a percentage of premium
- This capital requires a return based on a number of factors including:
  - Risk-Free rates available
  - Volatility of returns
  - Correlation of returns with other assets

## Example

- Capital required as percentage of premium: 50%
- Required return on capital: 15%
- Time for capital to be held: 5 yrs

# Premium Components: Profit

---

- Setting the profit target as a return on equity generally too “conceptual” for underwriters.
- Underwriters generally have more limited exposure to the capital and expenses side of the business
- More appropriate to express the required return as a target loss ratio.

# Premium Calculation

---

$$\begin{aligned}\text{Premium} &= \text{Discounted Expected Claims} \\ &+ \text{Discounted Expenses} \\ &+ \text{Premium} * \text{Capital Backing} * \text{Rate} \\ &= 62.68 + 23.68 + (\text{Premium} * 0.5 * 0.15 * 5) \\ &= 138.18\end{aligned}$$

- This can be expressed as a target loss ratio:

$$\begin{aligned}\text{Target Loss Ratio} &= 80 / 138 \\ &= 58\%\end{aligned}$$



# Table of Contents

---

Introduction

Overall Premium Level

**RBC Considerations**

Risk Factors and loadings

Conclusion

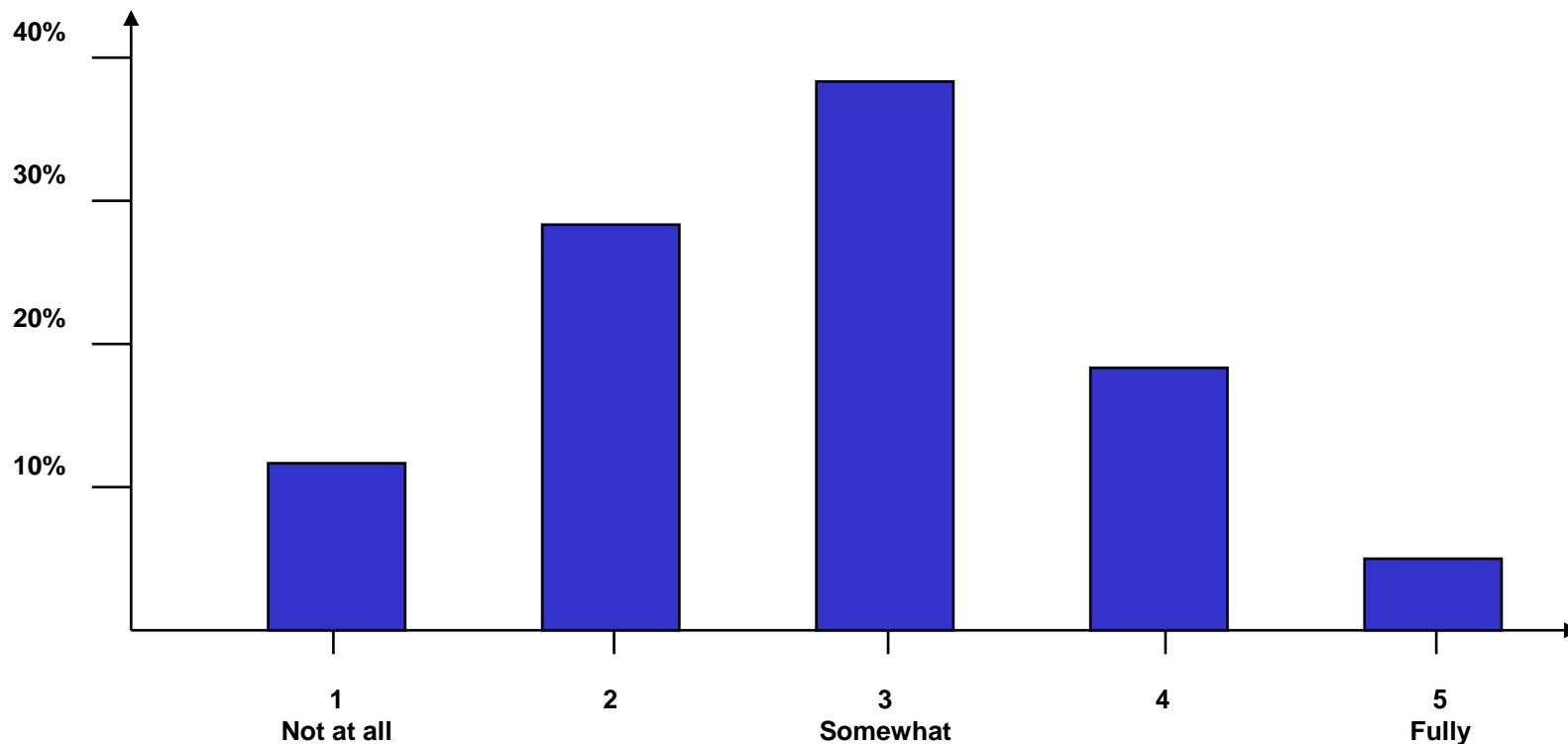
# Impact of RBC

---

- Capital is not set as a percentage of premium
- The capital required for a policy can be determined at different stages in the life of a policy
- Loss Ratio assumptions a key determinant of capital requirements – common approach
- Less common is to use the capital to determine the target loss ratio – gaining momentum

# Impact of RBC

- How integrated is pricing with capital modelling?
  - Results of UK Survey for GIRO 2008



# RBC Calculation

---

- Singapore / Malaysia / Australia based on Capital Adequacy Ratio (CAR) formula:

$$\text{CAR} = \frac{\text{Total Capital Available}}{\text{Total Capital Required}}$$

**> Specified %**

# RBC Calculation

---

- **Specified CAR%:**
- Two aspects to consider:
  - Regulatory requirement eg 120% or 130%
  - Company requirement eg 150%
- Company requires a buffer above regulatory requirement to allow for “*normal*” fluctuations
  - Size of buffer depends on volatility of results and ease of access to additional capital if required

# RBC Calculation

---

- **Total Capital Available:**

**Tier 1 Capital** = Paid-up ordinary shares  
+ Retained Earnings

**+ Tier 2 Capital** = Irredeemable Preference Shares  
+ Subordinated Debts

**- Deductions** = Goodwill & other intangible assets  
+ Investments in Subsidiaries  
+ Other deductible

# RBC Calculation

---

- **Total Capital Required:**

Insurance Risk Capital Charge  
+ Credit Risk Capital Charge  
+ Market Risk Capital Charge  
+ Operational Risk Capital Charge

# RBC Calculation

---

- **Insurance Risk Capital Charge:**

= Claim Liability Risk Capital Charge

+ Premium Liability Risk Capital Charge

= Claim Liability \* Risk Load %

+ Premium Liability \* Risk Load %

= (OSC + 75% IBNR) \* Risk Load %

+ Max (UPR, 75% URR) \* Risk Load %

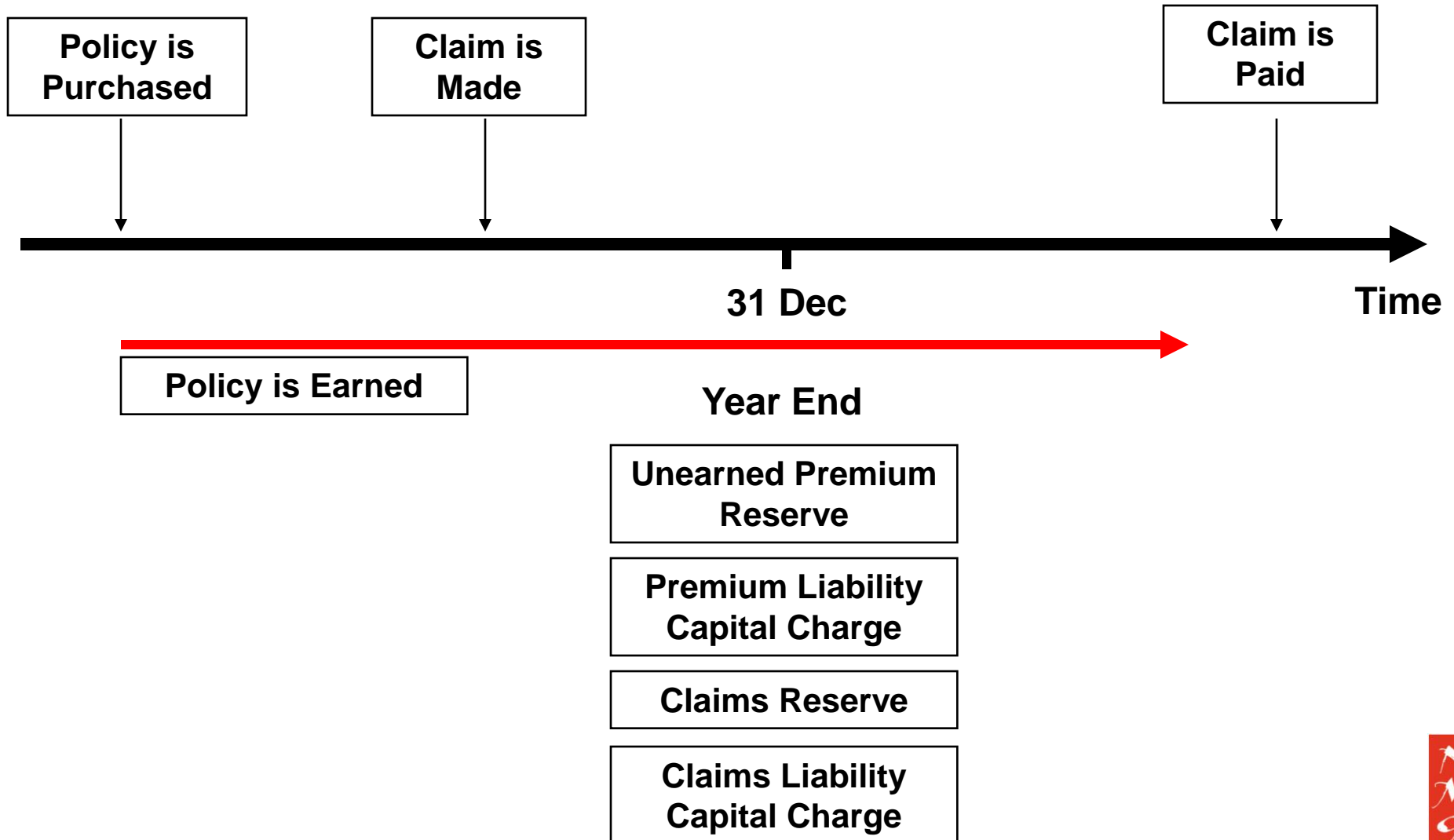


# RBC Calculation

---

- **Credit and Market Risk Capital Charges:**
  - Detailed breakdown of investments with a separate loading for each asset type
  - Can be simplified to a single percentage of assets
- **Operational Risk Capital Charges:**
  - Often calculated as a percentage of assets

# Life cycle of a policy



# Life cycle of a policy – Portfolio Example

Written Premium	0.5	\$138	
Acquisition Costs	0.5	\$15	
PL & CL Reserve	1.0		\$108
Capital Required	1.0		

# RBC Calculation

---

## Capital Required (Simplified)

$$= (\text{Insurance Risk} + \beta\% \text{ Assets}) * \text{CAR}\%$$

## Assets (Simplified)

$$= \text{Liabilities} + \text{Equity}$$

$$= \text{Reserves} + \text{Capital Required}$$

## Capital Required (Simplified)

$$= \frac{\text{CAR}\% * (\text{Insurance Risk} + \beta\% \text{ Reserves})}{1 - \beta\% \text{ CAR}\%}$$

# Life cycle of a policy – Portfolio Example

Policies Written	0.5	\$138		
Acquisition Costs	0.5	\$15		
PL & CL Reserve	1.0		\$108	
Capital Required	1.0		\$48	-\$33
Management Exp	1.5	\$5		
CL Reserve	2.0		\$92	
Capital Required	2.0		\$33	\$26
Claim is Paid	5.5	\$85		
CL Reserve	6.0		\$0	
Capital Required	6.0		\$0	\$40
Total Profit				\$33

# Return on Capital – Portfolio Example

- Insurer's Cash-flows

Time 1.0	- \$ 33
Time 2.0	\$ 26
Time 6.0	\$ 40

- Factor in Time Value of Money
- Implied return for insurer: 26%
- Can solve Target LR for different RoC requirements:
  - 15%: Target ULR = 64%
  - 20%: Target ULR = 61%

# Return on Capital

---

- **Additional Considerations**
  - Return on Assets Invested
    - At 2% return 15% RoC Target LR becomes 71%
    - Different assets have different return and risk characteristics
  - Initial Capital Requirements
    - Theoretical vs Available
    - All capital of the company needs to be allocated
    - Eg Starting with \$40 capital reduces Target LR by ~ 4%
  - Relationship between Target LR and Premium Volume
    - Can include price elasticity considerations to solver
  - Reinsurance

# Return on Capital

---

- **Assumptions Required Include**
  - Premium
  - Expenses
  - Timing of Claim Payments
  - PRAD for Claims and Premium
  - Capital Loading for CL and PL
  - Capital Loading for Market and Credit risk
  - Capital Loading for Operational Risk
  - Initial Capital



# Table of Contents

---

Introduction

Overall Premium Level

RBC Considerations

**Risk Factors and loadings**

Conclusion

# Why have risk loadings?

---

- Within a class of business there are subgroups which have different risks
- These groups should be charged different premiums according to their risks
  - A premium set according to the risk can be shown to be the most equitable approach to premium setting
  - Sometimes “community rating” is employed to reduce premium loading on extreme risks. This involves some cross-subsidisation. Generally occurs on compulsory risks
- Risk classification and loadings vary in sophistication between classes of business and regions

# How to calculate risk loadings

---

## Various levels of sophistication

1. Individual Risk Rating
  - For large complicated risks with significant premium there may be sufficient experience to rate the risk individually
2. Burning Cost
  - If there are only a few groups to be modeled then their relative profits can be compared and the premiums adjusted accordingly
3. Single Factor Analysis
  - Each rating factor analyzed individually and then controlled for before analyzing the next factor.
4. Generalised Linear Modeling (GLiM)
  - All factors analyzed simultaneously through multi-variate regression

# Table of Contents

---

Introduction

Overall Premium Level

Risk Factors and loadings

RBC Considerations

**Conclusion**

# Conclusion

---

- Pricing should have a firm foundation in reserving
- Cost Plus approach used to calculate the “Minimum Acceptable Loss Ratio”
- Current RBC methodology allows calculation considering:
  - Claims
  - Expenses
  - Profit (based on Return on Capital)
- Individual risks in a class require loadings or discounts based on their relative risk ranking

---

# Questions?