

# **Risk Based Capital vs Solvency II**

## **A Singapore Case Study**

**SAS Presentation**

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# Agenda

- Risk Based Capital Framework in Singapore
- Solvency II Framework
- RBC Singapore vs Solvency II
- Illustrative example (1) – Non-participating Whole of Life
- Illustrative example (2) – Unit-linked
- Conclusions

# Singapore Risk Based Capital Framework

## Background

# RBC Singapore

- The Singapore RBC framework, as defined in ***Insurance (Valuation and Capital) Regulations 2004***, was implemented on 1 January 2005.

## Summary of RBC framework

- Value of assets: Assets are valued at market value.
- Value of liabilities: Policy liabilities are determined using a gross premium valuation method with a best estimate basis plus an additional provision for adverse deviation (“PAD”).
- Capital Requirements: Total risk requirements (“TRR”) are the sum of C1, C2 and C3 risk requirements, where
  - C1 risk requirement reflects insurance risk charges
  - C2 risk requirement reflects market, credit and mismatching risk charges on both assets and liabilities
  - C3 risk requirement reflects concentration risk charges on assets
- Financial resources (available capital): Financial resources are the admissible assets available to meet the solvency requirements. Financial resources must be at least 100% of the TRR for each fund, and at least 120% of the TRR at a company level, subject to a minimum amount of S\$5 million.

# Valuation of assets and liabilities

- Assets are valued at market value.
- Non-participating liabilities are valued using best estimate assumptions plus a provision for adverse deviations (“PADs”), discounted at MAS prescribed risk free rate.
- Investment linked liabilities is set equal to unit reserves plus non-unit reserves. Non unit reserves are valued using same principles as other non participating business.
- Participating policies are valued as the maximum of:
  - Guaranteed benefits (best estimate assumption, PADs, MAS prescribed risk free rate)
  - Guaranteed and non guaranteed benefits (best estimate assumptions, PADs, discounted at best estimate rate)
  - Policy assets (market value)
- Policy liabilities at an individual policy level must be floored at zero

## MAS prescribed risk free rate:

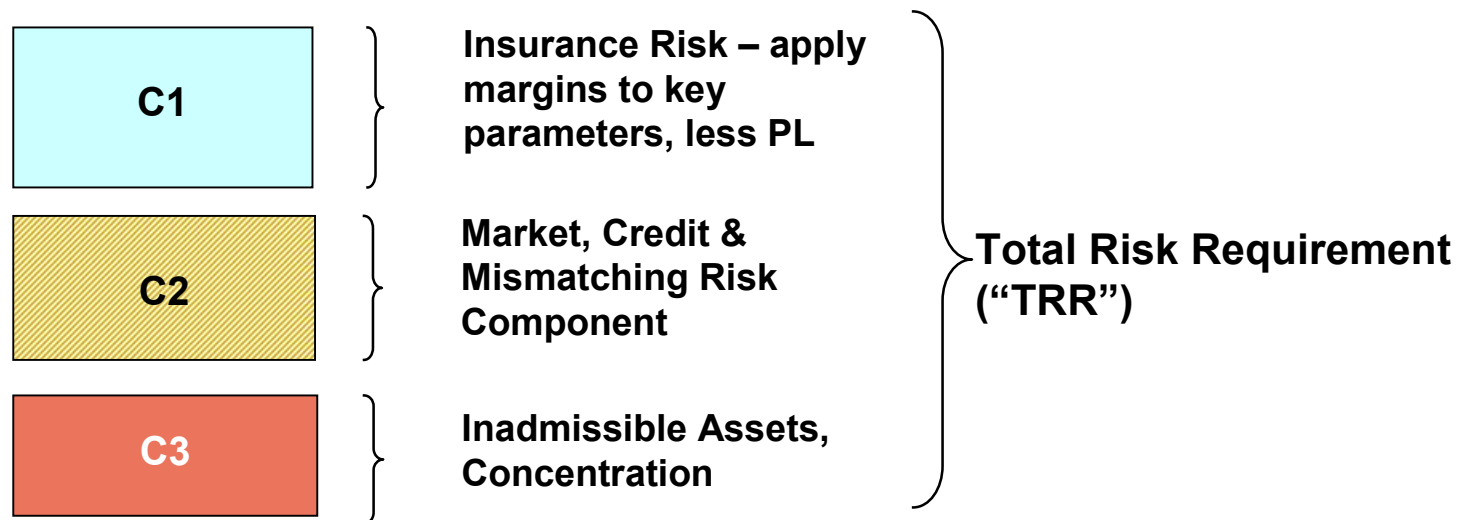
- Term < 10 years: Market yield of Singapore government bonds
- 10<Term<15 years: Interpolating 10 year yield and stable long term risk free discount rate (“LTRFDR”)
- Term>15 years: LTRFDR which is based on 90% of average 15 year yield and 10% of current 15 year yield.

# Capital requirements

- Two tier solvency requirement where each respective fund had to meet a **Fund Solvency Requirement** (“FSR”) while the insurer as a whole had to satisfy the **Capital Adequacy Requirement** (“CAR”).
- In respect of an insurer as an aggregate
  - Defined to be:  
$$CAR = \text{Available Capital} / \text{Required Capital}$$
  
$$\text{Required Capital} = \text{Fund Solvency Requirement} + \text{Risk Charges of shareholders' Fund};$$
  
$$\text{Available Capital} = \text{Financial resources from life funds (excludes participating)} + \text{Adjusted Financial resources from par funds} + \text{Available Capital of Shareholders' Fund}$$
  - Needs to be at least 120% to avoid regulatory action.
  - Also require financial resources of at least S\$5 million.
  - Financial resources from Par Fund adjusted such that CAR excluding participating business will not be greater than the CAR after including the participating business.

# Fund Solvency Requirement

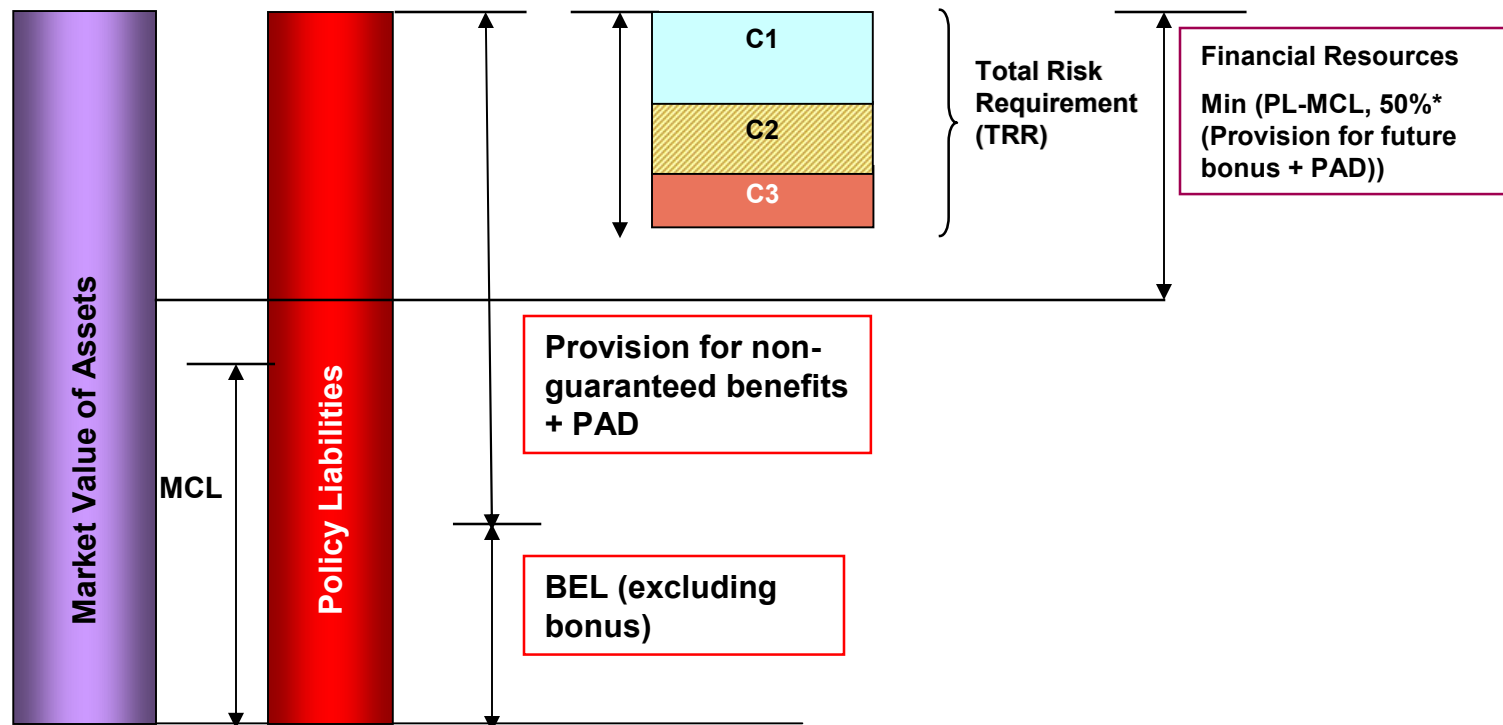
- To meet fund solvency requirement, fund needs to sufficient **Financial Resources** (“FR”) meet **Total Risk Requirement** which consists of three components



- FR is
  - Participating fund: Min (50% provision of future bonuses + PAD, PL – MCL)
  - Other funds: excess of assets over liabilities.

# Fund Solvency Requirement – Par business

## Participating fund

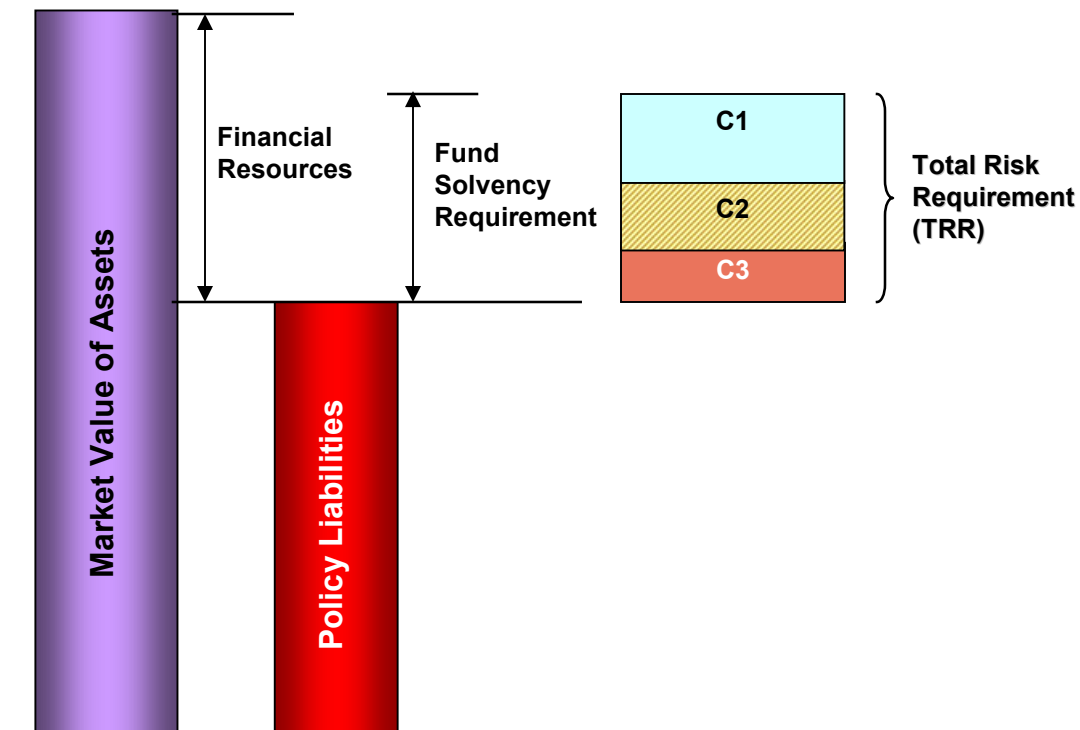


**Financial resources reflect the ability of a company to adjust bonuses to absorb fluctuations**



# Fund Solvency Requirement – Other business

Other funds



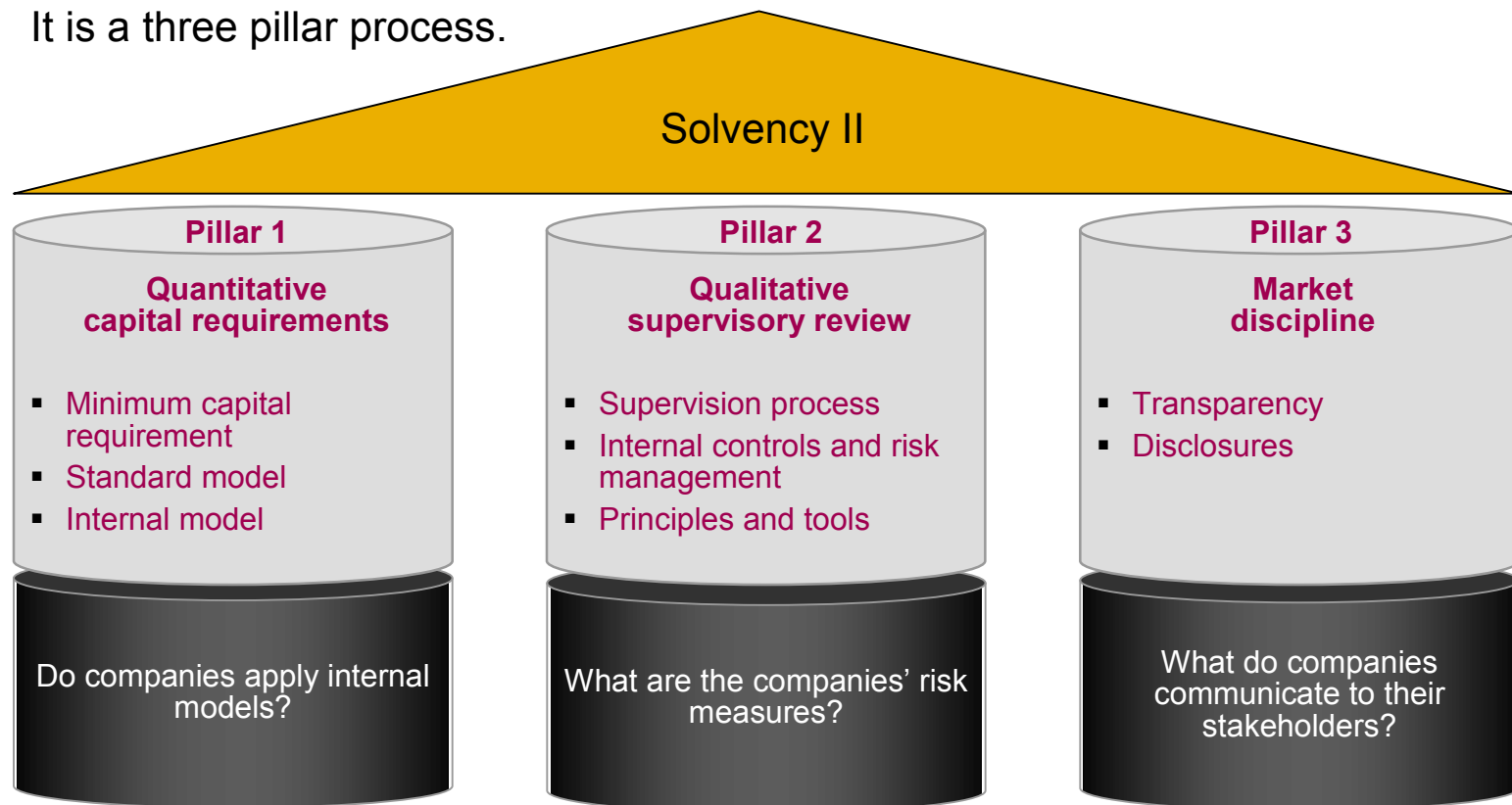
Financial resources in a fund have to exceed FSR

# Solvency II Framework

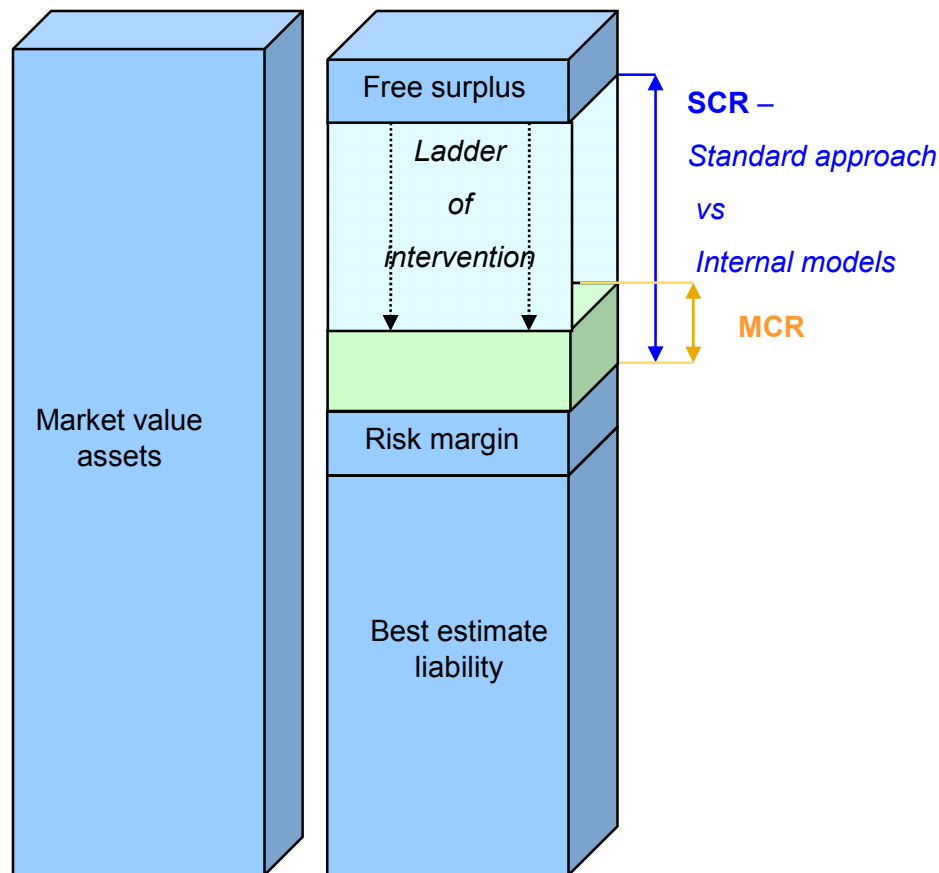
## Background

# What is Solvency II?

- An Insurance Directive from the European Union (“EU”) to streamline the regulatory framework for insurance companies across the European states as well as convergence with the banking sector (“Basel 2”).
- Expected to be implemented across Europe in 2012.
- It is a three pillar process.



# The Solvency II Framework



- Technical provisions to cover obligations at fair value (best estimate plus risk margin)
- Assets at market value
- Minimum Capital Requirement (“MCR”) defines the safety net
  - factor based calculation
  - capped and floored at 50% and 20% SCR
- Solvency Capital Requirement (“SCR”) to absorb unforeseen losses
  - 99.5% with a one year time horizon
- Between SCR and MCR ladder of intervention with increasing scrutiny from the regulator.

# Highlights of QIS 4 valuation (1)

## Assets

- Market value of assets

## Liabilities

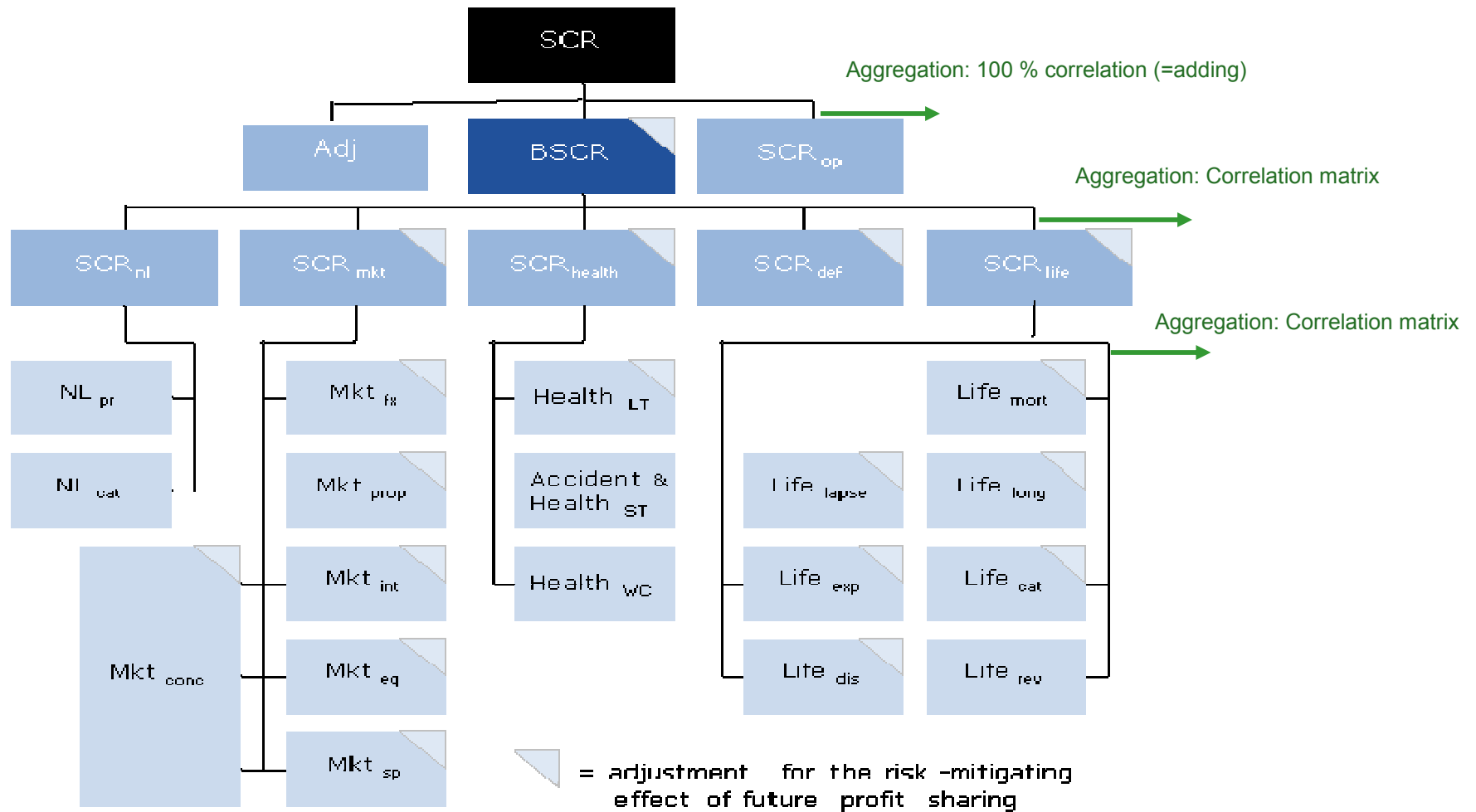
- Policyholder liabilities = Best estimate value of technical provisions + Risk Margin
- Best estimate value of technical provisions
  - Market consistent (best estimate) valuation, discounted at swap
  - Stochastic technique required to calculate the time value cost of financial options and guarantees
  - No surrender value floor
  - Reflection of policyholder behavior and management decisions
  - Separate valuation of gross reserves and reinsurance recoverable (including counterparty risk)

## Highlights of QIS 4 valuation (2)

- Risk Margin
  - Cost of Capital approach
  - A function of future SCR's operational, underwriting and reinsurance default risks
  - Limited diversification applied

Time	SCR <sub>i</sub>		Cost of Capital		Capital charges		Discount factor
0	SCR <sub>0</sub>	*	6 %	=	Cap charge <sub>0</sub>	*	D <sub>0</sub>
1	SCR <sub>1</sub>	*	6 %	=	Cap charge <sub>1</sub>	*	D <sub>1</sub>
2	SCR <sub>2</sub>	*	6 %	=	Cap charge <sub>2</sub>	*	D <sub>2</sub>
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
ω	SCR <sub>ω</sub>	*	6 %	=	Cap charge <sub>ω</sub>	*	D <sub>ω</sub>

# SCR standard formula - overview



Source: QIS 4 Technical Specifications

## SCR standard formula – TS.VIII.

$$SCR = BSCR + SCR_{Op} - Adj$$

$BSCR$  = Basic Solvency Capital Requirement

$SCR_{Op}$  = SCR for operational risk

$Adj$  = adjustment for the risk absorbing effect of future profit sharing and deferred taxes

$$BSCR = \sqrt{\sum_{r \times c} CorrSCR_{r,c} \bullet SCR_r \bullet SCR_c}$$

$$SCR_{Op} = \min[0.3 \bullet BSCR, OP_{non\_ul}] + 0.25 \bullet Exp_{ul}$$

$$OP_{non\_ul} = \max \left[ \begin{array}{l} 0.03 \bullet (Earn_{life} - Earn_{life\_ul}) + 0.02 \bullet Earn_{nl} + 0.02 \bullet Earn_{health} \\ 0.003 \bullet (TP_{life} - TP_{life\_ul}) + 0.02 \bullet TP_{nl} + .002 \bullet TP_h \end{array} \right]$$

$$Adj = Adj_{FDB} + Adj_{DT}$$

$$Adj_{FDB} = \min \left[ \sqrt{\sum_{r \times c} CorrSCR_{r,c} \bullet SCR_r \bullet SCR_c} - \sqrt{\sum_{r \times c} CorrSCR_{r,c} \bullet nSCR_r \bullet nSCR_c}; FDB \right]$$

$$Adj_{DT} = \Delta deferredtaxes | \text{loss of "BSCR - Adj}_{FDB} + SCR_{Op}"}$$



# Solvency II updates

## Summary of key changes

## Proposed key Solvency II changes since QIS4 (Life business only)

- CP40 (advice on the risk free interest rate) recommends that the risk free interest rate structure should normally be based on the yield on relevant government bonds, which is a change from QIS4 in which swap rates were used.
- CP42 (advice on the risk margin) states that CEIOPS have considered research carried out by the CRO Forum and GNAIE, and it is suggesting a cost-of-capital rate of at least 6% (QIS4 assumed 6%). The SCR for the purposes of the risk margin has been extended from QIS4 to include "unavoidable market risk" which might occur for example where there are very long term liabilities and there are no matching assets of the required duration.

## Key differences between the two frameworks

## Comparison of the two frameworks

	Singapore RBC Framework	Solvency II
Assets	Market value	Market value
Liabilities	<p>Non-participating</p> <ul style="list-style-type: none"> <li>• Policy liability = BEL + PAD</li> </ul> <p>Participating</p> <ul style="list-style-type: none"> <li>• Policy liability = Max (Value of asset, MCL, GPV)</li> </ul> <p>Unit-linked</p> <ul style="list-style-type: none"> <li>• Policy liability = Unit reserves + Non unit reserves</li> </ul> <p>Other points</p> <ul style="list-style-type: none"> <li>• Discounting at MAS prescribed long term RF Rate</li> <li>• Liabilities floored at zero</li> </ul>	<p>All products</p> <ul style="list-style-type: none"> <li>• Policy liability = BEL + Risk Margin</li> <li>• BEL determined on a MCEV basis.</li> <li>• Stochastic models required for calculating time value cost of options and guarantees</li> <li>• Risk margin determined using cost of capital approach</li> <li>• Cash flows are discounted using government bond yield</li> </ul>

## Comparison of the two frameworks

	Singapore RBC Framework	Solvency II
Capital requirement	<ul style="list-style-type: none"> <li>• Determined at a fund level and company level.</li> <li>• All individual insurance funds will need to meet FSR</li> <li>• Company will also need to hold CAR of at least 120%.</li> <li>• Minimum S\$5 million</li> </ul>	<ul style="list-style-type: none"> <li>• Companies need to meet both SCR and MCR. Different levels of intervention for each breach.</li> <li>• SCR can be determined using either prescribed charges or internal models. Calibrated assuming 99.5% CI with time interval of 1 year.</li> <li>• SCR allows for diversification of risk through correlation matrix</li> <li>• MCR determined using a linear formula approach</li> <li>• Both SCR and MCR calculated at a company level</li> </ul>
Participating fund adjustment	<ul style="list-style-type: none"> <li>• Financial resources for par fund used in determining CAR will be adjusted such that CAR after par fund will not exceed CAR before par fund contribution</li> </ul>	<ul style="list-style-type: none"> <li>• Surplus from par fund for SCR calculations will be adjusted such that it will not be used to subsidise other business</li> </ul>

## Illustrative examples

## Illustrative examples

- Two case studies
  - Regular premium Non-participating whole of life
  - Regular premium Unit-linked
- For both case studies, we have carried out a valuation under
  - Singapore RBC
  - Solvency II
- To determine the asset risk charges, we have assumed that the level of assets held is equal to the regulatory reserves under each framework.
- Prescribed European Standard Formula is used to calculate the solvency requirements under the Solvency II framework
- Valuation date is 30 November 2008 –the peak of global financial crisis with lowest government bond yields in most countries.

## Illustrative example (1)

### Non-participating Whole of Life



## Model point details

- Model point detail
  - Regular premium non-participating whole of life
  - Age 40 at valuation date
  - Sum assured of S\$100,000
- Investment strategy assumed in determining capital requirement

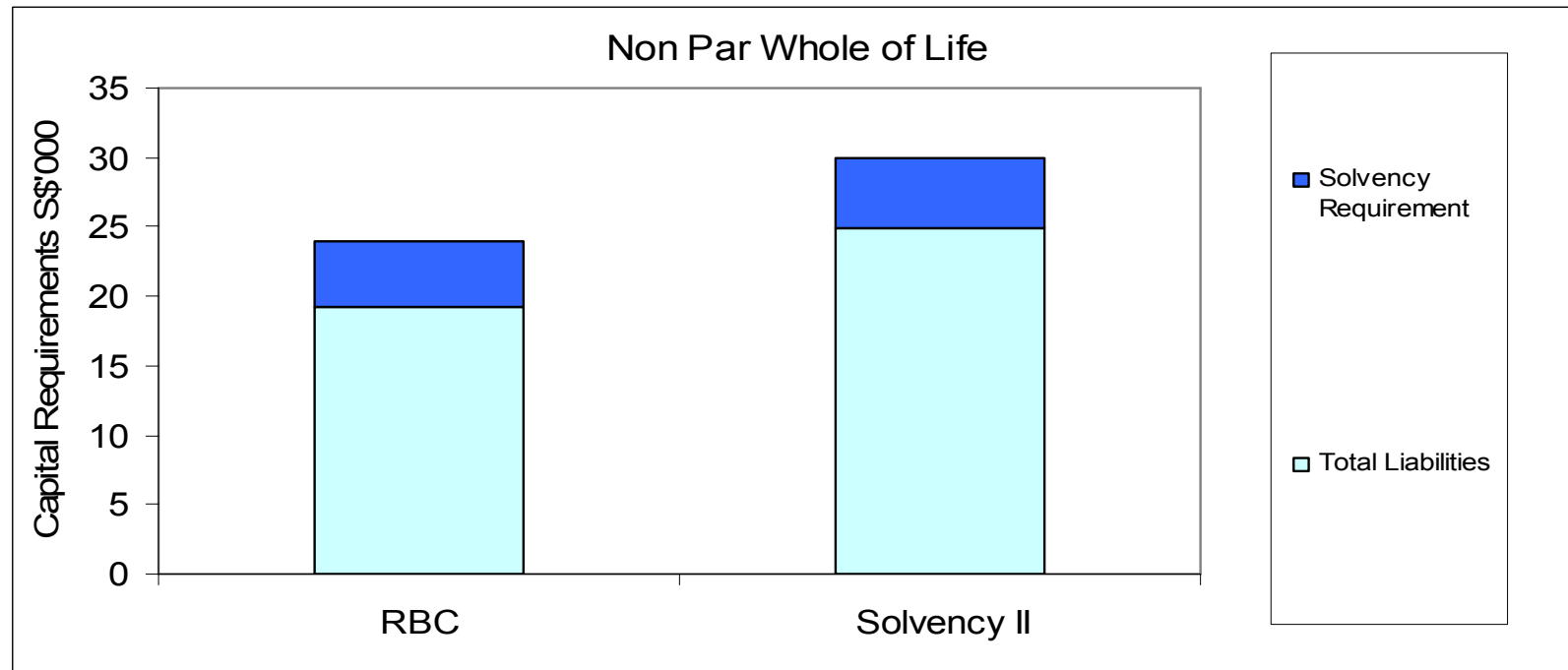
Investment strategy	Asset Mix
Equity	10%
Government Bonds - 7 years	60%
Corporate Bonds, AA - 7 years	30%

- 7 year bond duration selected as it is representative of what's generally available in market
- We have ignored taxation in our calculations.

# Results

Non-participating Whole Life	RBC	Solvency II
Total Liabilities	19,207	24,930
Total Solvency Requirement	4,819	5,037
Capital requirements: (Liabilities + Solvency Requirement)	24,026	29,967

- Capital requirements (includes reserves and solvency capital) is significantly more onerous under the Solvency II framework
- Liabilities has increased by 30% and solvency capital increased by 5%.



## Comments

Duration	Risk Free Yield Curve	
	Singapore RBC	Solvency II*
1	0.73%	0.73%
2	0.86%	0.86%
3	1.08%	1.08%
4	1.31%	1.31%
5	1.53%	1.53%
6	1.72%	1.72%
7	1.90%	1.90%
8	2.03%	2.03%
9	2.16%	2.16%
10	2.29%	2.29%
11	2.61%	2.35%
12	2.93%	2.41%
13	3.26%	2.48%
14	3.58%	2.54%
15+	3.90%	2.60%

\* In the study, we have assumed risk free rate to equal yields on government bonds rather than swap rates

- Key factor contributing to significant increase in liabilities under Solvency II is due to a move from MAS prescribed long term risk free rates to actual risk free rates without adjustment under Solvency II.
- As a result of the global financial crisis, actual 15 year yield on 30 November 2008 was very low compared to the historic average 15 year yield.
- The 15 year government bond yield has since increased so under the current economic conditions the capital requirements under the two frameworks are expected to be closer.

## Illustrative example (2)

Unit-linked

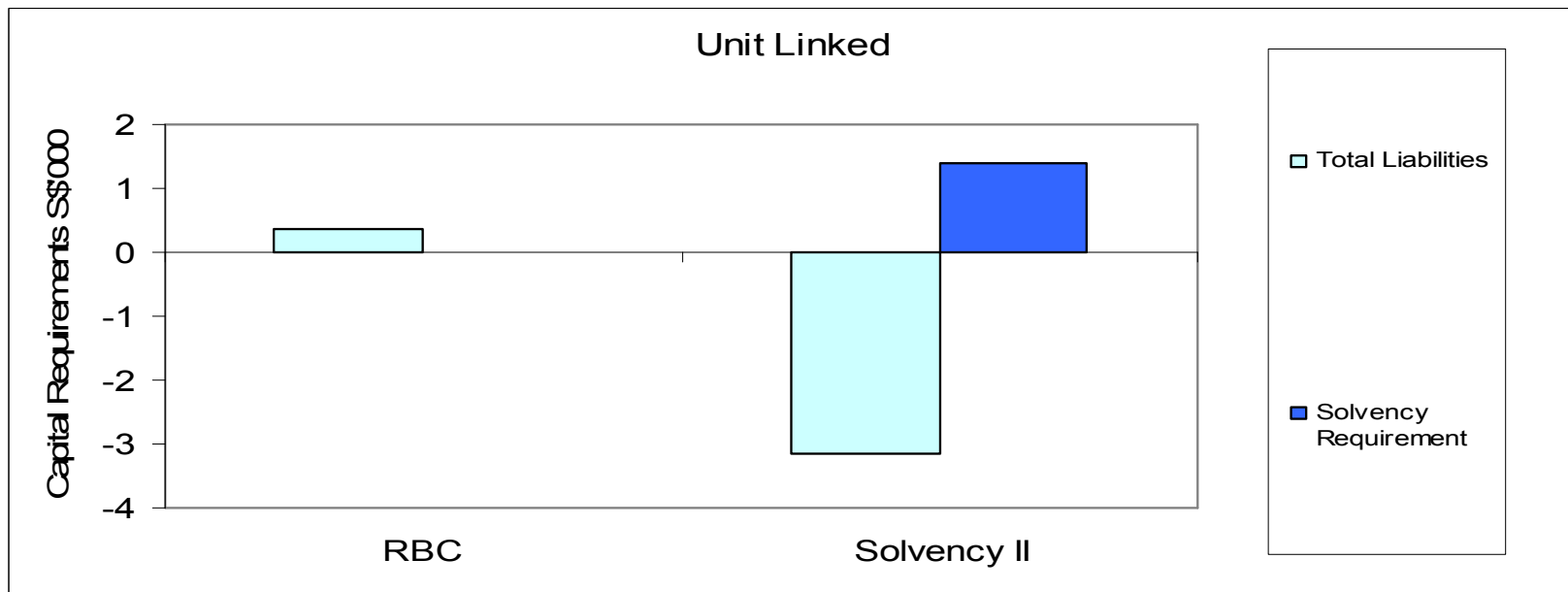
## Model point details

- Model point detail
  - Regular premium whole of life unit-linked policy
  - Policy has been IF for 3 years
  - Annual premium of S\$1,200
- Assume 100% of units are invested in equities
- Impact of taxation ignored in calculations

# Results

Unit-linked	RBC	Solvency II
Total Liabilities	355	(3,156)
Solvency Requirements	0	1,404
Capital requirements: (Liabilities + Solvency Requirement)	355	(1,752)

- Capital requirements (total liabilities plus solvency requirements) under the Singapore RBC framework is significantly higher than the requirements under Solvency II, QIS 4.
- Key factor contributing to the difference in the capital requirements is the removal of the floor of zero at a policy level which essentially allows for the capitalisation of future profits.
- Capital requirement for lapse risk is significant as it is floored at 30% of surrender strain.



# Conclusions

## Estimated impact for each class of business

Products	Impact	Reason
Participating products	-ve to Neutral	<ul style="list-style-type: none"> <li>Depends on the strength of the participating fund.</li> <li>If fund is strong, the move to a Solvency II framework should have a neutral impact on the overall solvency of the company as both frameworks do not allow surplus from participating fund to cross subsidise other life funds.</li> <li>If the fund is weak and requires support from shareholders to support the bonuses/ current guarantees, Solvency II is expected to have negative impact as liabilities are discounted at risk free rates rather than long term investment returns and includes a time value cost for financial options and guarantees;</li> </ul>
Unit-linked products	+ve	<ul style="list-style-type: none"> <li>Solvency II allows for the recognition of future profits</li> </ul>
Protection products	+ve	<ul style="list-style-type: none"> <li>Solvency II allows for the recognition of future profits</li> </ul>



## Estimated impact for each class of business

Products	Impact	Reason
Long term non-participating savings business (Endowment/ Whole of Life)	-ve	<ul style="list-style-type: none"><li>The long term MAS prescribed risk free rate is significantly higher than Solvency II risk free rates. A move to a lower discount rate will result in higher liabilities.</li></ul>
Non-participating annuity business	-ve	<ul style="list-style-type: none"><li>Under Solvency II, we expect liabilities to increase due to the fall in risk free discount rates.</li><li>In addition, the longevity stress is fairly onerous under Solvency II which will increase the difference further.</li></ul>

In our investigation, we have not taken into account correlation across products. For example, under the Solvency II Framework, underwriting risk can be reduced by combining a term product with an annuity product as mortality risk charges will be off-set by longevity risk charges.

# Conclusion

## WHY WOULD SOLVENCY II BE A CONCERN TO SINGAPORE INSURERS?

- For European subsidiaries, they will be required to report Solvency II back to their Group.
- Possibility of the MAS adopting best practices from Solvency II framework.

## WHAT WOULD BE THE KEY CHALLENGES TO IMPLEMENT SOLVENCY II IN THE REGION?

- Implementation of Solvency II will likely see a change in product offerings, e.g. moving from traditional participating products to investment linked business.
- There will be a need to set up stochastic models as required for determining the time value cost of financial options and guarantees. Some key issues in relation to this are:
  - Do we have sufficient market data to calibrate an appropriate ESG file?
  - How do you extend the risk free yield curve beyond the observed term?
  - How to enhance liability models to allow for stochastic calculations?
- Implementation will likely be a bigger issue for local insurers than for European multi-nationals who may have already report MCEV profits

# Questions

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