ACTUARIAL PARTNERS

building value together

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General Takaful Workshop

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Quarterly IBNR Valuation

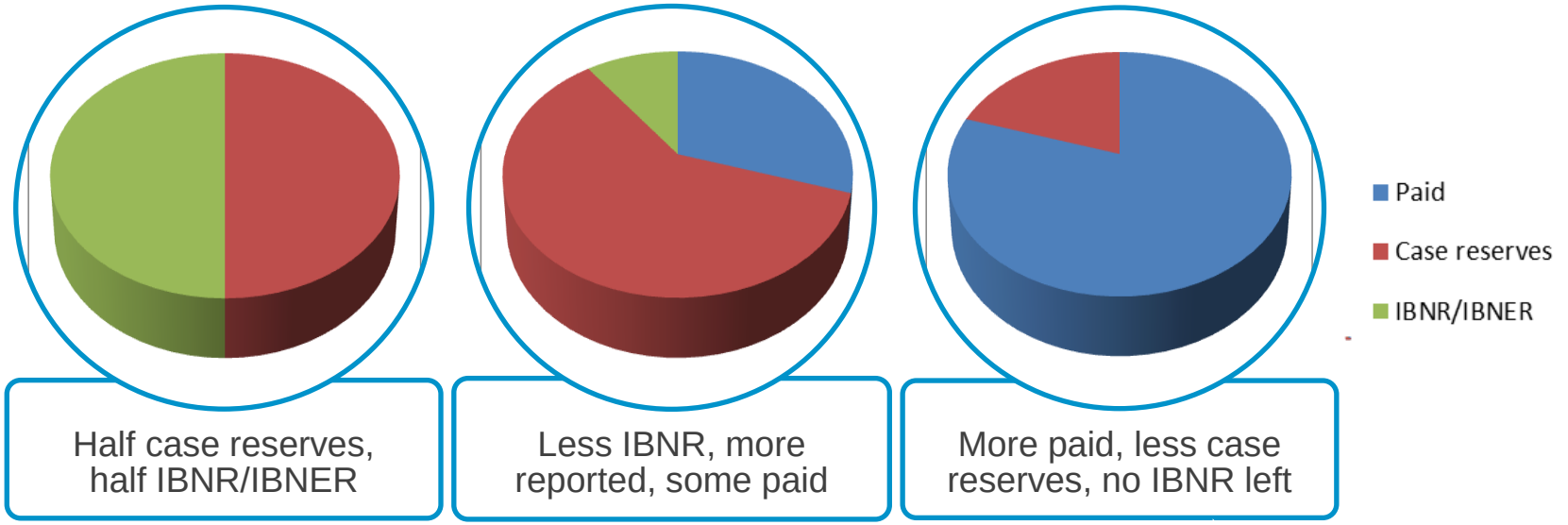
Valuation Methodology
Quarterly IBNR

- Our preferred approach for the quarterly estimation of IBNR claims is the **Retrospective Approach**.
- Suppose a quarterly IBNR valuation was performed as at 30 September 2012, for a company with a FYE 31 December 2012.
  - ***In respect of business earned up to 31 December 2011***, we adjust the IBNR provisions as at 31 December 2011 for claims paid since that date and changes in case estimates in respect of that business.
  - ***In respect of business earned from 1 January 2012 to 30 September 2012***, we determine the IBNR provisions by estimating the expected ultimate claims amount (using NEC and the *resultant ULR corresponding to the 2011 loss year in the financial year ending 31 December 2011 estimation*), adjusted to reflect claims already paid and case estimates established in respect of the reported claims.

Valuation Methodology

Quarterly IBNR – business earned up to 31 December 2011

Claims paid for existing reported claims	Claims incurred for newly reported claims	Increase in claims incurred for existing claims
• comes out of outstanding case reserves previously set up	• comes out of IBNR previously estimated	• comes out of IBNER previously estimated



Provision of Risk Margin for Adverse Deviation (PRAD)

Provision of Risk Margin for Adverse Deviation (PRAD)

- IFRS4 Phase I required that reserves be set at a prudent level; i.e. best estimate plus margin
- Margin = **Provision of Risk Margin for Adverse Deviation (PRAD)**
- Can be either explicit or implicit
- If explicit, can determine PRAD at a certain confidence level
- In Malaysia, BNM has specified that this margin/PRAD is to be determined at 75th percentile confidence level
- PRAD is held in respect of all the estimated general takaful (i.e. outstanding claims and contribution) and expense liabilities

Valuation Methodology
PRAD – Outstanding Claims Liability

Outstanding Claims Liability

- Bayesian estimation with Markov chain Monte Carlo simulation (BMCMC)
- Chain Ladder method with bootstrapping (CLB)
- Generalised linear models with bootstrapping (GLMB)
- Kalman filter on state-space models (KF)
- Thomas Mack method (MACK)
- Stochastic Chain Ladder Method (SCL)

- BMCMC, GLMB, KF and SCL are versatile methods to depict and highlight the most important properties under various situations, especially in identifying the underlying trends along the accident period, the development period, and the calendar period
- Nevertheless, the real trends could sometimes be covered up or distorted by noise in the data, and extreme care is necessary in confirming any past trends discovered and in assuming any future trends
- CLB and MACK are rather restrictive in this regard, and they can be deemed as fast means to provide a rough picture of the overall situation

Valuation Methodology
PRAD – Contribution Liability

Contribution Liability

- Two of the common approaches in estimating the risk margin for the contribution liability are as follows:
  - Assume that the loss ratios follow a **normal** or **lognormal distribution**;
  - Express the risk margin as a **multiple of the risk margin for the outstanding claims liability** of the same business class.
    - Adjustment would be made based on Australia industry benchmark factors for short tail and long tail classes from “The Research and Data Analysis Relevant to the Development of Standards and Guidelines on Liabilities Valuation for General Insurance” produced by Tillinghast for the Institute of Actuaries of Australia (IAA) in 2001.

Valuation Methodology
PRAD – Expense Liability

Expense Liability

- Similar to the risk margin for the contribution liability, the risk margin for the expense liability could be estimated based on the assumption that expense ratios follow a **normal** or **lognormal distribution**.

Valuation Methodology
PRAD

In general, in cases where data available is not sufficiently reliable to allow for the application of the statistical methods as listed above, the Takaful Operator could rely on

the **experience of the general takaful/insurance industry**

in setting the risk margin assumption for each class of business

Valuation Methodology

Numerical Example on PRAD for Outstanding Claims Liability

Stochastic Chain Ladder Method with a Bornhuetter-Ferguson Adjustment

Parameters: Mean and Standard Deviation of Grossing-Up Factor

Distribution: Lognormal

Output: Estimated Outstanding Claims

Numerical Example

Part 1 – Claims Triangle

Loss Year	Net Cumulative Claim Payments in Development Year								
	0	1	2	3	4	5	6	7	Ult
2005	629,873	1,430,237	1,461,617	1,463,187	1,463,187	1,463,187	1,463,799	1,463,799	1,463,819
2006	1,765,017	2,621,763	2,661,255	2,674,410	2,760,790	2,760,897			
2007	1,235,399	2,767,096	2,894,766	3,105,503	3,105,577				
2008	1,071,696	2,245,396	2,251,472	2,253,078					
2009	1,351,749	1,800,434	1,854,687						
2010	707,681	1,366,789							
2011	879,511								

Loss Year	Grossing Up Factors in Development Year								
	0	1	2	3	4	5	6	7	Ult
2005	0.4303	0.9771	0.9985	0.9996	0.9996	0.9996	1.0000	1.0000	1.0000
2006	0.6390	0.9492	0.9635	0.9683	0.9995	0.9996			
2007	0.3976	0.8906	0.9317	0.9995	0.9995				
2008	0.4705	0.9857	0.9884	0.9891					
2009	0.7006	0.9331	0.9612						
2010	0.4849	0.9365							
Selected:	0.5520	0.9365	0.9612	0.9891	0.9995	0.9996	1.0000	1.0000	1.0000
Latest:	0.4849	0.9331	0.9884	0.9995	0.9995	0.9996	1.0000	1.0000	1.0000
Latest 2:	0.5927	0.9594	0.9601	0.9839	0.9995	0.9996	1.0000	1.0000	1.0000
Latest 3:	0.5520	0.9365	0.9612	0.9891	0.9995	0.9996	1.0000	1.0000	1.0000
Average:	0.5205	0.9471	0.9705	0.9891	0.9995	0.9996	1.0000	1.0000	1.0000
Std Dev	0.1069	0.0409	0.0212	0.0118	0.0032	0.0035	0.0035		

Mean

Numerical Example
Part 2 – Simulated Output

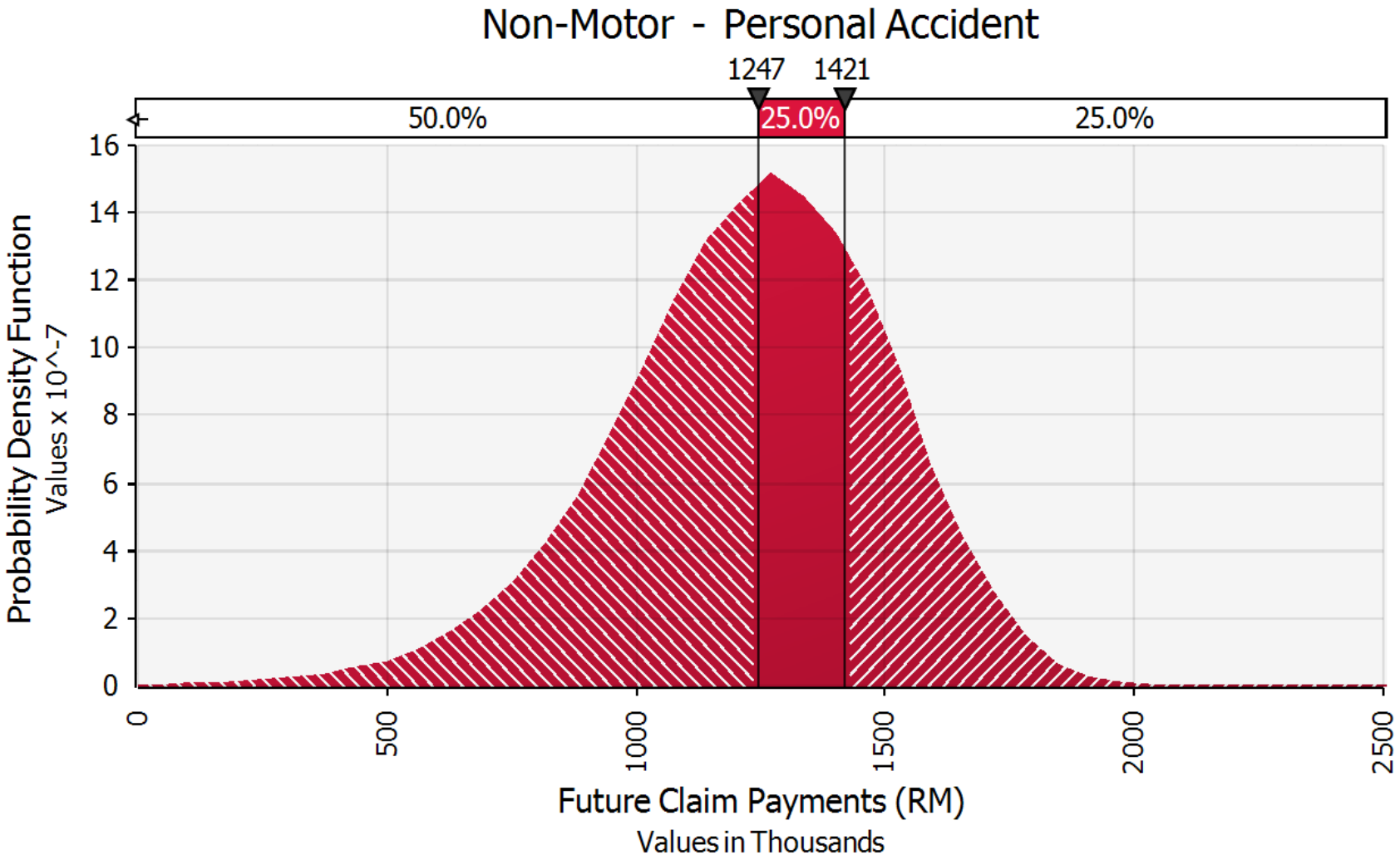
Loss Year	Projected Cumulative Claim Payments in Development Year								
	0	1	2	3	4	5	6	7	Ult
2005	629,873	1,430,237	1,461,617	1,463,187	1,463,187	1,463,187	1,463,799	1,463,799	1,463,819
2006	1,765,017	2,621,763	2,661,255	2,674,410	2,760,790	2,760,897	2,762,051	2,762,051	2,762,089
2007	1,235,399	2,767,096	2,894,766	3,105,503	3,105,577	3,105,637	3,106,935	3,106,935	3,106,977
2008	1,071,696	2,245,396	2,251,472	2,253,078	2,276,875	2,276,919	2,277,872	2,277,872	2,277,903
2009	1,351,749	1,800,434	1,854,687	1,908,617	1,928,772	1,928,809	1,929,616	1,929,616	1,929,643
2010	707,681	1,366,789	1,410,805	1,460,507	1,479,081	1,479,115	1,479,859	1,479,859	1,479,883
2011	879,511	1,747,674	1,803,494	1,866,523	1,890,078	1,890,122	1,891,065	1,891,065	1,891,096

Loss Year	Projected Claim Payments in Development Year										Case Estimate	IBNR
	0	1	2	3	4	5	6	7	Ult	Total		
2004									0	0	0	0
2005								0	20	20	20	0
2006							1,154	0	38	1,192	2,056	(865)
2007						60	1,298	0	42	1,401	48,080	(46,680)
2008					23,796	44	953	0	31	24,825	176,464	(151,639)
2009				53,931	20,155	37	807	0	26	74,956	227,913	(152,957)
2010			44,016	49,701	18,574	35	744	0	24	113,094	578,835	(465,740)
2011		868,163	55,820	63,029	23,555	44	943	0	31	1,011,585	1,011,875	(290)
Total										1,227,072	2,045,243	(818,171)

Output

Numerical Example

Part 3 – Distribution of Total Outstanding Claims



Quarterly Risk Margin Valuation

Valuation Methodology
Quarterly Risk Margin

- Our **Risk Margin template** computes the Claim, Contribution and Expense Liabilities at a 75% probability of adequacy.
- Once the best estimate level is determined, the margin from 50th to 75th percentile flows through.
- Minor readjustment from diversification benefit and mix of business.

RBCT Reporting Forms – General Takaful & Expense Liabilities

RBCT Reporting Forms – General Takaful Liabilities

Form	Description
K	**General Takaful Fund – Claim / Contribution Liabilities and Risk Capital Charges** **Section (A) – Claim Liabilities and Related Risk Capital Charges** • Separate columns are provided for the Best Estimate of CL, PRAD and FPRAD for business within and outside Malaysia
	Section (B) – Contribution Liabilities and Related Risk Capital Charges • Separate columns are provided for the UCR (computed in accordance to the Guidelines on the Valuation Basis for Liabilities of General Takaful Business), Best Estimate of URR, PRAD, FPRAD and PL for business within and outside Malaysia • Although the 'Total' PL is automated (calculated as the higher of UCR and URR at the 75th percentile) the breakdown by class needs to be input. The split by class should be according to URR at the 75th percentile, even if UCR is higher – the implication being that the excess above 75th percentile is distributed across all classes

RBCT Reporting Forms – Expense Liabilities

Form	Description
M	**Expense Liabilities and Related Risk Capital Charges** • Separate columns are provided for the Provision for UWF, Best Estimate of UER, PRAD and Expense Liabilities • Expense Liabilities (EL) is similar to PL in that 'Total' is automated (calculated as the higher of Provision for UWF and UER at the 75th percentile) but breakdown is to be input
	• Column I, **EL Risk Capital Charge**, has not been automated • BNM leaving interpretation of recommended basis open. "For the purpose of computing the shareholders' fund expense liabilities risk capital charges for general takaful business, the best estimate expense assumptions shall be stressed by 20%." **EL Risk Capital Charge (column I)** **= 120% x Best Estimate of UER (column E)** **minus Expense Liabilities (EL) (column H)** • Could be zero if risk margin for calculating FPRAD is more than 20% • Unclear whether at class level or at Total Fund level

RBCT Reporting Forms – General Takaful & Expense Liabilities Flow Through

Form	Description
G	**General Takaful and Expense Liabilities Risk Capital Charges** • Details the risk capital charges from Forms K and M (automated)
C	**Capital Required** • Columns Q and AE pertain to General Takaful (automated)
A	**Computation of Capital Adequacy Ratio** • Column AG pertains to General Takaful (automated)

Q & A

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