



Observation of Risk-Based Capital for development of Solvency Margin of Thailand



Introduction

What is Capital?

- $\text{Asset} - \text{Liability} = \text{Capital}$
- Capital is injected from shareholder /investor /entrepreneur
- For corporation, if $\text{Liability} > \text{Asset}$, Capital is depleted to zero (not negative)

Balance sheet	
Asset	Liability
	Capital & Surplus



Introduction

Objective of Capital*

- Absorb large unexpected losses
- Provide enough confidence to external investors and rating agencies on financial health and viability of the firm

*From “The professional Risk Mangers’ Handbook” (Edited by Carol Alexander and Elizabeth Sheedy)



Capital vs Reserve

Reserve is different from Capital in several points. For examples,

- Reserve is established to pay liability in future
- Loss recognition
- NB recoverability



How much we should hold Capital?

Measurement of Capital

- Simple formula (e.g. 2% of reserve)
- Risk Based Capital (RBC)
- Economic Capital (EC)



Risk Based Capital (RBC)

“RBC is amount of capital that company should hold based on a risk assessment of company”

- Amount of capital
- Company should hold
- Based on risk assessment



RBC is the minimum hold capital level so that company always ensures asset will higher than liability

Relevant parties...

- Regulator
- Crediting agency
- Shareholder / investor
- Policyholder

RBC is concerned in the point of company's solvency



Observation in Development on RBC



Observation in development on RBC

- Current Thai style: 2% of statutory reserve
- Traditional UK style: 2% of NaR and 4% of statutory reserve.
- Traditional Malaysia style: 2% of NaR and 4% of statutory reserve.
- Standard & Poor's capital adequacy model (2005 version)
- Current Indonesia solvency margin
- Risk-Based Capital Framework in Singapore
- New Risk-Based Capital Framework in Malaysia
- Solvency II in Europe or economic capital as true risk-based measures, and UK Financial Service Authority (FSA)



Simple factor with fixed percentage to all products

Advantage

- Simple and easy to calculate in both product level and portfolio level
- Low cost and least complicate to derive and implement
- One fit all factor for all products



Simple factor with fixed percentage to all products

Disadvantage

- The amount of capital required doesn't relate to the risk the company possesses.
- It can not reflect asset allocation and asset mix of the company. The company can hold same capital amount no matter how risky portfolio the company is holding.
- It does not reward the performance of ALM strategy of the company.
- Different product type can have different type of risk. Yet, can't reflect in this model



Factor derivation style

Advantage

- Simple and easy to calculate in both product level and portfolio level.
- Low cost to derive and implement. Basically, it needs to define type of risk, stratify product categories, collect all exposure, and then generate risk factor in each set. This can be performed periodically (e.g. biannually)
- Investment strategy, including ALM and asset mix, can reflect the amount of required capital
- Different product type can have different factor. One fit all factor for each product type category.



Factor derivation style

Disadvantage

- Not be able to address some type of risk that can evolve
- Still have regulatory arbitrage.
- Asset is valued in “book value” basis or “amortized value” which there is no linkage between asset and liability.
- It somehow can not reflect the level of capital for the balance sheet containing derivatives and off balance sheet.
- Investment securities tend to be more complicated in the market, traditional monitoring may not be able to guarantee solvency of insurance company in future.



More risk sensitive model

Advantage

- Encourage risk management
- Risk factor is based on projection and index to financial health of company
- Assist bureau and insurance company to monitoring financial status and risk
- Consistent to “fair value” concept
- If regulation not cover some risk, it is opened to talk to regulator (e.g. Monetary Authority of Singapore) for discussion in particular risk



More risk sensitive model

Disadvantage

- Each company needs to have good cash flow projection
- Cash flow projection is subject to assumption which appointed actuary has to review and underpin it before any usage of such projection.
- It is necessary to implement the software or system to handle cash flow projection.
- Definition of “risk free yield curve” has to be articulate and applicable.
- Frequency for marked-to-market basis can make the result more fluctuate and volatile than previous basis.



Most advanced risk-based model

Advantage

- Reflect best risk management practice
- The amount of capital is based on projection and index to financial health of company.
- Assist bureau and insurance company to monitoring financial status and risk.
- Every risk is consistent to fair value and marked-to-market concept.
- Solvency II in Europe or economic capital as true risk-based measures, and UK Financial Service Authority (FSA)



Most advanced risk-based model

Disadvantage

- Each company needs to have extensive cash flow projection to calculate amount of capital.
- Assumptions of each parameter for shocking up and down are necessary and left to the judgment of appointed actuary.
- The model might be complicated and consume considerable resource to come up with the results.
- Regulator has to review the basis and judgment of individual company separately.
- Solvency II is on discussion and will be implemented in 2011.



What else can be done, if not RBC ?

- Minimum working capital
- Stress testing
- Dynamic solvency testing (DST)
(Indonesia, Malaysia, Hong Kong)
- Cash flow testing, such as NY-7 interest scenario in US



What can be holistically achieved and positioning for Thailand?

encourage well risk management practice while having effective model but not too complicated to implement by Life insurance industry in Thailand.



From advantage and disadvantage in each model era of RBC development

- The amount of capital required should be related to the risk that the company has hold.
- Different product feature and product category should have different amount of risk charged or capital required
- Risk factor should at least address asset risk, insurance risk, interest rate risk, and business/operation risk.



From advantage and disadvantage in each model era of RBC development

- Good RBC model should improve the perception and confidence of market to media and public interest.
- The model should also be able to track any anomaly of company's financial health.
- The advanced model should provide interactive between assumptions. Dynamic lapse is the interactive between lapse rate assumption and interest rate (or crediting rate for Universal Life)



From advantage and disadvantage in each model era of RBC development

- Model, which requires cash flow projection from each company in industry, is imperative to have following issues being ready
 - Appointed actuary who can underpin judgment in assumption on cash flow projection.
 - Definition of Risk free rate might be adopted, and then need to be articulate and accessible.
 - Reasonable in frequency of marked-to-market
 - Software and implementation of each company in order to generate rational results.



From advantage and disadvantage in each model era of RBC development

- Model, which requires fair value concept to be adopted in industry, is imperative to have.
 - Accounts team for cooperation on balance sheet items.
 - Handling the fluctuation and interpretation of surplus
 - Definition of risk free rate is crucial.
 - Definition of admitted asset to identify surplus.
 - Accounting practice to book the bond
 - Identification of major source of solvency margin.



From advantage and disadvantage in each model era of RBC development

- The ideal model should encourage diversification effect
 - Diversify in product level.
 - Diversify in the company level.
 - Diversify among countries and affiliates.
- The ideal model should encourage natural hedging in product design.
 - Mortality and morbidity risk, such as accelerated health product
 - Lapse and surrender charge
 - Investment margin and mortality margin



Rudimentary establishments for Thai industry

- Cash flow projection
- Definition of risk free rate
- Actuarial assumption and actuarial judgment
- Concept to deal with participating contract
- Influence from management
- Appointed actuary
- Number of actuary in the industry
- System and software implementation



Rudimentary establishments for Thai industry

- Sudden change from book value of fixed income to market value of fixed income:
- Perception from the industry (e.g. local media, local financial analyst, foreign investors) and cost of implementation to achieve ideal target surplus comparing to other industries (e.g. banks, brokers, etc.)
- Technical advice, monitoring, and interpretation from regulator



Recommendation to positioning of Thailand

- Solvency II or economic capital might be a long-term implementation plan in Thai industry.
- Adopting wait-and-see strategy for the implementation of solvency II
- Thai industry should cultivate the solvency II and economic capital concept, and target to implement it.
- Understanding of advantage and disadvantage of solvency II and economic capital to the country itself is necessary.



Recommendation to positioning of Thailand

- More risk-based model (e.g. Singapore or Malaysia's model) also mainly need cash flow projection.
- GPV method is necessary to be well established in order to implement this. It is recommended to adopt this when every relevant parties in industry is ready to implement and understand fair value concept.
- Considerable expertise and technical advice are essential and required from the actuaries
- No longer use modified net level premium method if decided to use this model.



Recommendation to positioning of Thailand

- For factor derivation style (e.g. Indonesia or US 2005's model), it is highly recommended that the solvency margin in Thailand should be at least adopted into this standard.
- Investment strategy, including ALM and asset mix, can reflect the amount of required capital which suffices the main objective of solvency margin
- Although this model may not be able to capture the complicated securities and off balance sheet very well, it is still moderately applicable to Thai industry



RBC for Thailand – moving forward

- Apparently, simple factor with fixed percentage to all products is not able to reflect appropriate risk charged to the company anymore.
- Performance versus complexity and data availability versus data quality are the main important tradeoffs that should be addressed. Presumably, a more complex model would have a higher level of performance, but the complexity may make it more time consuming and less understandable.



RBC for Thailand – moving forward

- Other factors to consider when choosing between the models are 1) how easy the model is to understand, 2) how robust the model is when new data is added into the analysis, and 3) the time to calibrate and recalibrate the model.
- It is recommended that back testing and assessment will help in choosing and calibrating the appropriate models.



RBC for Thailand – moving forward

- Hybrid between factor derivation style (Indonesia and US) and more risk based model (Singapore and Malaysia) might be the most holistic approach for local industry at this moment.
- Foreign currency risk and reinsurance risk are the outstanding point whether the industry would like to adopt or not.
- It is upon how asset and liability expose to currency risk.



RBC for Thailand – moving forward

- In addition, the author would suggest the industry to pursue one of the following alternatives to pad up the gap between factor model and more risk based model.
 - Dynamic solvency testing (DST) and financial conditional report (FCR)
 - GPV method on some type of risk, such as interest rate risk.

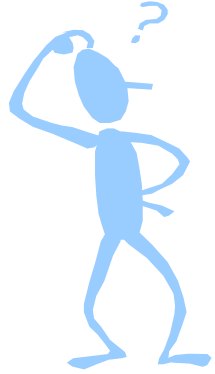


สมาคมนักคณิตศาสตร์ประกันภัยแห่งประเทศไทย
THE SOCIETY OF ACTUARIES OF THAILAND

Tommy Pichet, FSA

Thank you





Q: How can we know if capital & surplus is adequate ?

A: Compare actual company capital with RBC formula, and see whether ratio is enough

“Risk Based Capital”

A focus on S&P requirement



S&P's Capital Adequacy Model

$$\text{Capital Adequacy Ratio} = \frac{\text{Total Adjusted Capital} - C1}{C2 + C3 + C4}$$

Total adjusted capital

= Stat capital & surplus + AVR + 50% div li
+ voluntary reserve

Capital Adequacy Ranges Per Rating Level		
Capital adequacy ratio	Indicating rating level	Assessment of capital adequacy
Less than 100%	BB or lower	Various
100%-125%	BBB	Good
125%-150%	A	Strong
150%-175%	AA	Very strong
more than 175%	AAA	Extremely strong

Capital Adequacy – Life Insurance Company



S&P's Capital Adequacy Model

Refer to “Life Insurance
Criteria: Capitalization”
published on 23-Sep 2004 by
Credit Analyst: Jose Siberon,
CFA, FSA, New York





C1 : Asset Risk

- Risk due to losing value what we invested
 - Default of bond
 - Depreciation of stock/real estate
- C1 factor is derived from
 - Fixed Income: default rate, recovery rate, and discount rate
 - Equity : one standard deviation of S&P's 500
- Factor for adjustment from diversification effect
 - Concentration risk
 - Size factor บน total invested asset
- Risk exposure is “Asset Value” (practically, use reserve in product level)



C1 : Asset Risk

- Unrated bond is drawback of model. Every bond which is not classified as international will be rated at “B” only.
- In product level, difficult to identify rating in each bond from portfolio
- Common stock is tied with S&P 500 (US stock market). Real estate will be simply marked up from common stock.
- Cash has C1, while Policy loan has no C1
- Separate account with (high) investment guarantee calculates with asset backing its product.
- Separate account with non-investment guarantee need to consider risk that value in account loss and cannot cover acquisition cost.



C1 : Asset Risk

ASSET RISK C-1	S&P	A	B	C	C	D
	Factor			Non PAR	PAR	
UNAFFILIATED BONDS						
NAIC Class 1 (A or higher)	0.0051	43.40%	31.50%	62.50%	25.20%	61.60%
NAIC Class 2 (BBB)	0.0391	43.40%	23.00%	4.10%	22.85%	4.20%
NAIC Class 3 (BB)	0.0936	3.20%				
NAIC Class 4 (B, or unrated bond)	0.1740			4.10%	22.85%	6.70%
NAIC Class 5 (CCC)	0.2756					
NAIC Class 6 (In or near default)	0.3000					
MORTGAGES						
RESIDENTIAL	0.0050		6.50%	11.20%		0.60%
COMMERCIAL & FARM	0.0200			3.70%		1.20%
Commercial Mortgage Backed Security	0.0450		15.00%			
UNAFFILIATED COMMON STOCK	0.1500	10.00%	24.00%	12.80%	18.90%	20.30%
REAL ESTATE & LONG-TERM ASSETS	0.1800			1.60%		
Cash	0.0030				10.20%	0.70%
Policy loan	0.0000					4.70%
TOTAL C-1 CHARGE		3.72%	5.37%	3.53%	7.8635%	4.72%



C2 : Insurance/Liability Risk

- Pricing risk (mortality, persistency, expense, and liability option). use NAR.
- The more NAR, the less risk factor (due to the law of large number)
- Risk exposure is NAR (Net Amount at Risk)
- Separate Life from Group, individual from health and disability due to using different claim study
- Separate account which guarantee (GMDB) will calculate unit reserve and NAR separately



OL, UL	C2 Factor	Company A		Company B	
		Amount	Capital Charge	Amount	Capital Charge
<\$500 mm	0.0020	500	1.00	500	1.00
\$500-5000 mm	0.0013	4,500	5.85	4,500	5.85
\$5000-25,000 mm	0.0010	20,000	20.00	20,000	20.00
> \$25,000	0.0008	17,681	14.15	40,372	32.30
Total		42,681	41.00	65,372	59.15
Adopted C2 Factor		1.681		1.583	

Group&Credit Life	C2 Factor	Company A		Company B	
		Amount	Capital Charge	Amount	Capital Charge
<\$500 mm	0.0016	500	0.80	500	0.80
\$500-5000 mm	0.0011	4,472	4.92	4,500	4.95
\$5000-25,000 mm	0.0008	0	0.00	7,948	6.36
> \$25,000	0.0007	0	0.00	0	0.00
Total		4,972	5.72	12,948	12.11
Adopted C2 Factor		2.013		1.637	

Capital Adequacy – Life Insurance Company



Separate account with non guarantee	C2 Factor	Company A		Company B	
		Amount	Capital Charge	Amount	Capital Charge
< \$5000 mm	0.0025	753	1.88	2,148	5.37
\$5000-25,000 mm	0.0010	0	0.00	0	0.00
> \$25,000	0.0006	0	0.00	0	0.00
Total		753	1.88	2,148	5.37
Adopted C2 Factor		0.44%		0.44%	

$$C2 = \text{Total Capital Charge} / \text{Total Amount} * 1.75 * 1000$$



C3 : Interest rate Risk

- Mismatch between “asset cash flow and “liability cash flow” when interest rates fluctuate which consequently reduce capital in balance sheet (i.e. loss)
- Cash Flow testing can help to assess the risk
- Risk exposure is “Reserve”
- Separate account with no investment guarantee will have no C3
- Annuity product has C3 higher than Life insurance product due to long tail liability and unpredictable cash flow.
- Annuity can classify as low, medium, and high risk. Key point to distinguish is Market Value Adjustment/surrender charge and flexibility of withdrawal.



C3 : Interest rate Risk

<i>Interest Rate Risk (C-3)</i>	S&P Factor	Adopted Factor
LOW RISK CATEGORY		
Life insurance	0.0050	0.875%
Separate Account Liabilities with Guarantees	0.0100	1.750%
MEDIUM RISK CATEGORY		
Annuity not withdrawable (excl. structured settlements)	0.0200	3.500%
Annuity with surrender charges	0.0200	3.500%
GICs	0.0200	3.500%
Annuity with market value adjustment-Guaranteed over 1 yr.	0.0200	3.500%
Structured settlements	0.0200	3.500%
HIGH RISK CATEGORY		
Annuity with no adjustments	0.0300	5.250%
Single Prem individual annuity (such as pension closeout)	0.0300	5.250%

- C3 of A&H product is nil if it is YRT type.
- C3 of disability rider is also nil although it pays long term liability (but it can treat as claim reserve)



C4 : Business/Operating Risk

- Risk due to management incompetence and fraud
- Risk exposure is “Premiums”
- Derived from experience of US companies

<i>Business Risk (C-4)</i>	S&P Factor	Adopted Factor
Life & annuity premium	0.0200	3.5000%
Accident and Health premium	0.0050	0.8750%
Separate account liability	0.0005	0.0875%



Possible actions to improve ratio

- Pricing Upgrade bond portfolio quality, Replace stock with convertible bonds/equity-linked bonds
- Diversify bond portfolio by increasing number of bond issuer
- Adjust 10 largest asset exposures with asset exposures with asset
- Securitize commercial mortgage
- Reduce reserve to statutory minimum
- Reinsurance, policy loan, sell of blocks of business



Regulator in US

RBC model law requires regulatory action ^{เมื่อ} กับการ RBC ratio

Company Action Level, if ratio is not enough

- Filing of Action Plan to restore Capital
- Filing of Action Plan, and regulator perform examination
- Regulator take control of insurer
- Required to place insurer under control



Risk-Based Capital Framework in Singapore



Risk-Based Capital Framework in Singapore

Solvency margin of insurance business in Singapore in the past:-

- Solvency = % of reserve
- Reserve method is modified net level premium which assumption can't tell how much conservative margin is applied
- Asset is valuated in “book value” basis or “amortized value” which there is no linkage between asset and liability



Risk-Based Capital Framework in Singapore

Investment securities tend to be more complicated in the market, traditional monitoring may not be able to guarantee solvency of insurance company in future.



Risk-Based Capital Framework in Singapore

New Framework of RBC

- Encourage risk management
- Index for financial health of company
- Assist bureau and insurance company to monitoring financial status and risk
- Consistent to “fair value” concept



Risk-Based Capital Framework in Singapore

Valuation of Assets and Liabilities

- Modified NLP vs GPV
- GPV of Non PAR business
- GPV of PAR business

Refer to “Risk-Based Capital Framework in Singapore” by Eric Seah published in “International News” as of Nov 2006



Risk-Based Capital Framework in Singapore

Valuation of Assets and Liabilities

Reserve under traditional framework:-

- Modified NLP with conservatively specified assumption by regulator
- No lapse rate assumed
- No non-guaranteed included



Risk-Based Capital Framework in Singapore

Valuation of Assets and Liabilities

Reserve under new framework

- “gross premium valuation” which use all cash flows from policy including non-guaranteed benefit
- use all assumptions under “best estimate basis” and plus “Provision for Adverse Deviation (PAD)” which is margin for uncertainty and volatility of best estimate assumption



Risk-Based Capital Framework in Singapore

Valuation of Assets and Liabilities

Reserve of nonparticipating product will use “risk free yield curve” (from yield curve of government bonds)



Risk-Based Capital Framework in Singapore

Valuation of Assets and Liabilities

Reserve of participating products:

1. guaranteed @ risk free yield curve
2. guaranteed + non-guaranteed @ best estimate yield curve which expects from participating portfolio

$$\text{Reserve} = \text{MAX} (\text{GPV1}, \text{GPV2})$$



Risk-Based Capital Framework in Singapore

Valuation of Assets and Liabilities

- Modified NLP vs GPV
- GPV of Non PAR business
- GPV of PAR business

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Risk-Based Capital Framework in Singapore

Solvency Margin Requirements

- Determine each portfolio separately
- Calculate risk charge from risk factor, so called, C1, C2 และ C3
- Risk charge will depend on level of exposure in each risk factor



Risk-Based Capital Framework in Singapore

Solvency Margin Requirements

C1 = insurance assumption

C2 = 1) asset portfolio risk

2) mismatch duration (of asset and liability)

C3 = concentration risk



Risk-Based Capital Framework in Singapore

C1 = insurance assumption

Derive 2 sets of reserve

1. best estimate assumption (plus PAD) and add risk margin to reflect assumption which might be unexpectedly beyond PAD
2. best estimate assumption (plus PAD)

C1 risk charge = difference between 1) and 2)



Risk-Based Capital Framework in Singapore

C2 = 1) asset portfolio risk

Determined by credit rating and maturity

- Common stock has risk charge at 16%
- Debenture has risk charge at 0.25-8%



Risk-Based Capital Framework in Singapore

C2 = 2) duration mismatch

Measure the impact of “value changed of asset and liability” when interest rates change in two scenarios (shock up and shock down)

- Liability valuation use “risk free yield curve” varying on each scenarios
- Asset valuation is fluctuated due to the volatility of bond prices



Risk-Based Capital Framework in Singapore

C3 = concentration risk

- Invested asset concentrate in certain types of asset or issuers
- No diversification to hedge the risk



Risk-Based Capital Framework in Singapore

Total Risk Requirement (TRR) = $C1 + C2 + C3$

Financial Resource (FR) = the amount of capital
in each fund available to meet TRR



Risk-Based Capital Framework in Singapore

CAR is defined as the ratio of total FR to total TRR,
for all funds combined

Capital Adequacy Requirement (CAR) = FR / TRR

- Meet CAR if $CAR > 120\%$
- If $CAR < 120\%$, must notify authorities and plan to rectify the situation



Risk-Based Capital Framework in Singapore

Impact of new RBC framework

- Reserves are more volatile due to the use of up-to-date risk free yield curve, causing CAR to fluctuate
- Companies are now actively performing Scenario testing to understand and evaluate the impact on capital



Risk-Based Capital Framework in Singapore

Impact of new RBC framework (Cont)

- Insurance company are more interested to reduce the duration gap
- Investment strategy of high return will have to contemplate the possibility of high risk with allocation of capital requirement
- Capital requirement is considered interactively in product design.



Risk-Based Capital Framework in Singapore

Refer to “Risk-Based Capital Framework in Singapore” by Eric Seah published in “International News” Nov 2006



“Anyway, RBC model cannot reflect the realistic solvency position of insurer”

Balance sheet	
Asset	Liability
	Capital & Surplus

- Asset valuation
- Liability valuation
- RBC formula
- Additional requirement for capital



Economic Capital (EC)

EC is “risk capital” assessed from the realistic scenarios and see how much capital the company should hold so as to maintain “solvency” over “certain time period” at “pre-specified probability” such as 99.95% (AA rating) in 1 year



Economic Capital (EC)

The amount of risk capital, assessed on a realistic basis, which a firm requires to cover the risks that it is running or collecting. Typically this is calculated by determining the amount of capital that the firm needs to ensure that its realistic balance sheet stays solvent, over a certain time period, with a pre-specified probability. Firms and financial services regulators should then aim to hold risk capital of an amount equal at least to **economic capital**.

The concept of economic capital differs from "Regulatory Capital" in the sense that "Regulatory Capital" is the mandatory capital the regulators require to be maintained while economic capital is the best estimate of required capital that financial institutions use internally to manage their own risk and to allocate the cost of maintaining regulatory capital among different units within the organization.



Components of EC

Standalone risk	
MARKET RISK	LIFE RISK
Interest Rate Equity Real Estate Other	Trend uncertainty Level uncertainty Volatility Calamity
CREDIT RISK	OPERATIONAL
Credit Risk	Operational risk
BUSINESS RISK	MORBIDITY RISK
Expense Persistency Volatility & Calamity Persistency Uncertainty	Current Uncertainty Current Volatility Calamity



Components of EC

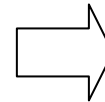
Value at Risk (VaR) measures Interest rate risk

- In 1 year, the company will be still solvent at confidential level of 99.95%
- Calculate Market Value Asset (MVA) and Market Value Liability (MVL)
- shock up / down interest rate, and see the difference of change of MVA and MVL



Value at Risk (VaR)

Balance sheet	
Asset = 100 Duration = 10	Liability = 80 Duration = 30
	Capital = 20



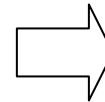
Balance sheet (Interest rates rise 1%)	
Asset = $100 - 10$ = 90	Liability = $80 - 30$ = 50
	Capital = 40

Shock up : no additional Capital in this case



Value at Risk (VaR)

Balance sheet	
Asset = 100 Duration = 10	Liability = 80 Duration = 30
	Capital = 20



Balance sheet (Interest rates decrease 1%)	
Asset = 100 + 10 = 110	Liability = 80 + 30 = 110

Shock down : hold Capital of 20 in this case



Value at Risk (VaR)

Balance sheet	
Asset = 100 Duration = 10	Liability = 80 Duration = 30
Capital = 20	

Balance sheet (Interest rates rise 1%)	
Asset = 100 - 10 = 90	Liability = 80 - 30 = 50
Capital = 40	

Balance sheet (Interest rates decrease 1%)	
Asset = 100 + 10 = 110	Liability = 80 + 30 = 110

Capital = 20 is cushion
for interest rate risk



Value at Risk (VaR)

Effective duration of Asset = 5 years

Effective duration of Liability = 25 years

Market Value Asset = 500 Million baht

Market Value Liability = 400 Million baht

Actuary forecast that “at confidential level of 99.95% in 1 year” will have volatility of interest rate around 1%

Q: How much capital should company hold for this “interest rate risk”



Value at Risk (VaR)

Capital before shock = 500 – 400

After shock up

$$\text{Asset} = 500 * (1 - 5\%) = 475 \text{ M Baht}$$

$$\text{Liability} = 400 * (1 - 25\%) = 300 \text{ M Baht}$$

After shock down

$$\text{Asset} = 500 * (1 + 5\%) = 525 \text{ M Baht}$$

$$\text{Liability} = 400 * (1 + 25\%) = 500 \text{ M Baht}$$



Value at Risk (VaR)

Shock up:

$$(500 - 400) - (500 \times (0.95) - 400 \times (0.75)) = -75$$

Shock down:

$$(500 - 400) - (500 \times (1.05) - 400 \times (1.25)) = 75$$

A: The company should hold Capital for such interest rate risk at 75 Million Baht