

Managing Capital Adequacy and Capital Utilization

ERM Symposium
Chicago, March 14, 2011

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Life's brighter under the sun



Disclaimer and References

- *Managing Capital Buffers in the Pillar II Framework - Designing an effective ICAAP/ORSA to manage procyclicality and reconcile short- and long-term views of capital*, Peter Miu, Bogie Ozdemir, The Journal of Risk Model Validation, Winter 2010
- *Value Optimization in a Regulatory Constrained Regime – A New Look at Risk vs. Return Optimization*, Peter Miu, Bogie Ozdemir, Michael Giesinger, December 2010, forthcoming, Journal of Risk Management in Financial Institutions
- Opinions expressed are those of the speaker and are not necessarily endorsed by the speaker's employer.
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Outline

- **2 Important Questions:**

1. How do we know we have enough capital given the environment, our Business and Risk Strategies?
2. How can we utilize our capital most efficiently?

1. **Managing Capital Adequacy**

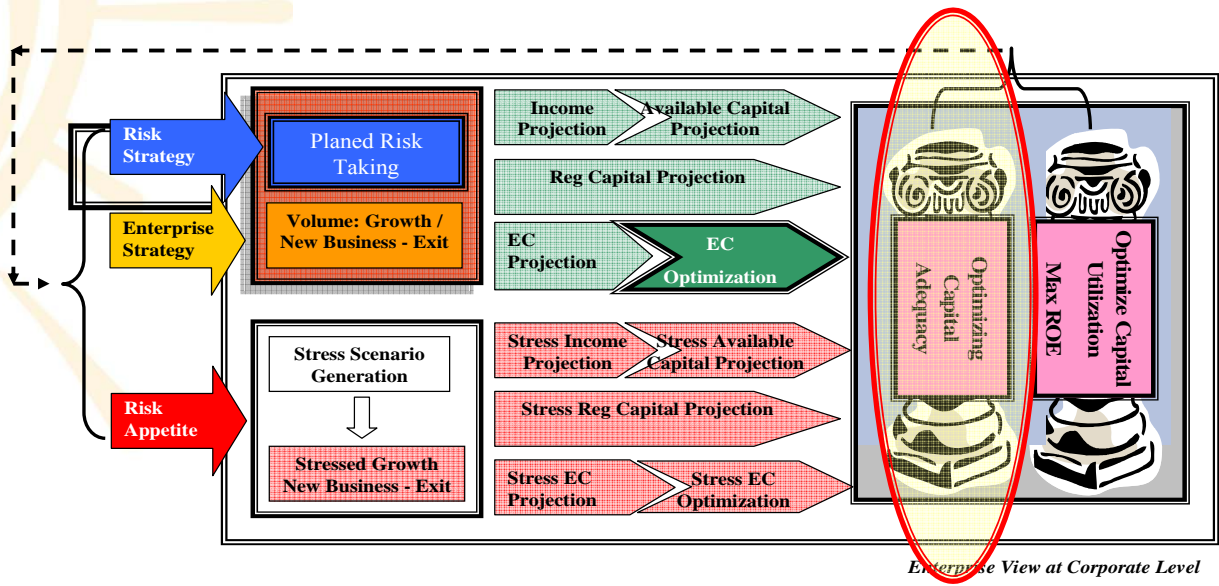
- Designing Effective ICAAP and ORSA
- Managing procyclicality, reconciling short- and long-term views of capital

2. **Managing Capital Utilization**

- Capital and Business Mix optimization

- **Focus will be on Framework Design**

Managing Capital Adequacy



Capital Adequacy – “Earlier” Practices and Challenges

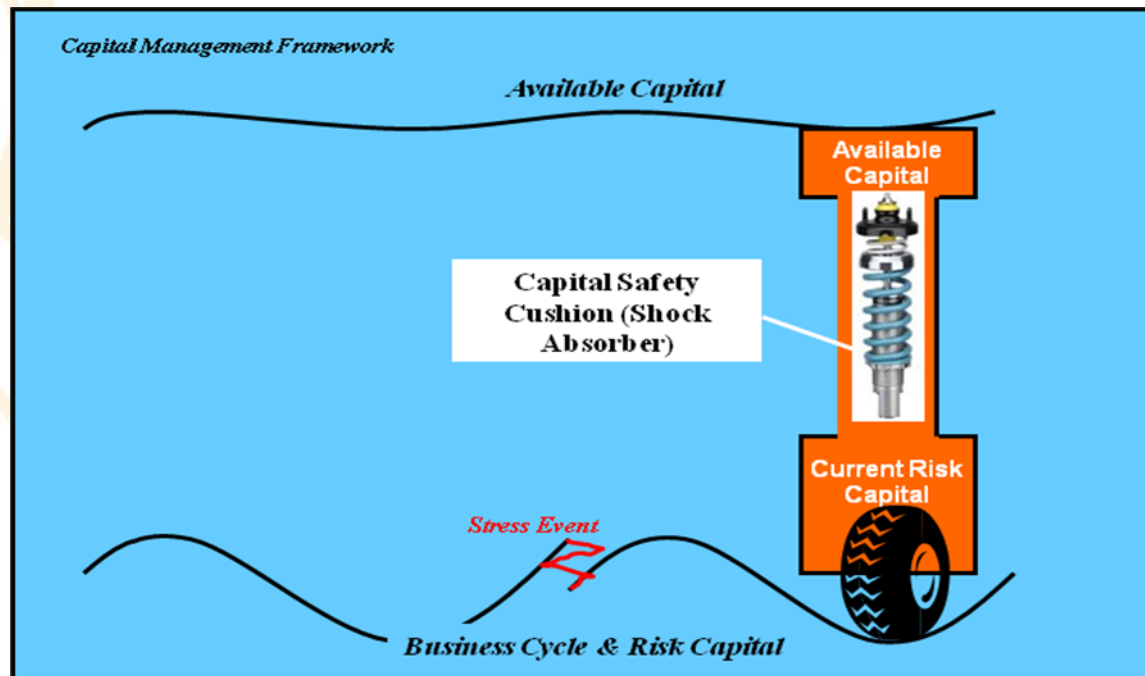
- **Capital Adequacy \equiv Book Value of Equity $>$ Max (Economic Capital, Regulatory Capital, Rating Agency Capital)**
- **But what should be the size of the capital buffer (surplus) with respect to**
 - Business cycle
 - Short and long term view
 - Expected and Potential Stressed Conditions
 - Risk Appetite
 - Corporate and Risk Strategy
 - Liquidity Concerns
- **Ad-hoc, non-standardized, non-creditable Stress Testing, not formally linked to Capital Adequacy assessment**
- **Liquidity not formally linked to Capital Adequacy assessment**
- **Insufficiently understood, defined and quantified Risk Appetite**
- **Capital and Liquidity Contingency Plans**
- **DCAT?**

ICAAP and ORSA are very similar and can help effective management of Capital Adequacy

	ICAAP	ORSA
Purpose	A comprehensive framework to plan and manage capital adequacy	A comprehensive framework to plan and manage capital adequacy
Development Stage	Well advanced in Europe, Canada, Australia, top priority in US	Rapidly advancing in Europe, not yet developed in both US and Canada
Risk Coverage	All measurable Risk (Pillar I + Pillar II) Credit, Market, Op Risk, Business Risk, Concentration Risk etc. Credit, Op Risk are more advanced	All measurable Risk (Pillar I + Pillar II) Credit, Market, Op Risk, Insurance Risk, etc Market Risk is most advanced.
Risk Horizon	Usually 3 years Advanced Banks start measuring both PIT and TTC views	Usually 3-5 years
Challenges	Validation/Governance Use test, formal linkage to Business Planning Effective Risk, Finance partnership	Validation/Governance Use Test, formal linkage to Business Planning Effective Risk, Finance partnership

The first Pillar – Solvency Management: ICAAP/ORSA

- Managing the Capital buffer between “Available Capital” (the supply) and “Risk Capital” (the demand) with respect to the organization's Risk Appetite and Strategic Objectives considering both expected and stress business conditions



ICAAP Design – Major Ingredients

- **Risk Capital**

- Economic Capital: More accurate and comprehensive but based on perceivably less uniform methodologies among the FIs and less validated
- Regulatory Capital: Known shortcomings, but considered more uniform and better validated
- Both suffer from the differences in risk rating philosophies

- **Available Capital:**

- Tier 1 or close deviations
 - Significant Reduction of Tier 1 (The new Basel Committee paper - *Strengthening the resilience of the banking sector*, Consultative Document, December 16, 2009).
 - Total Common Equity to RWA ratio is a significantly better “predictor” of distress than Tier 1 to RWA and than (Tier I + Tier II) / RWA
 - Leverage ratios did not “predict” distress, once risk based capital ratios are taken into account
- Available Capital forecast for the next 3 years: Tier 1 + Forecasted Net Income

- **Risk Appetite – dual measure**

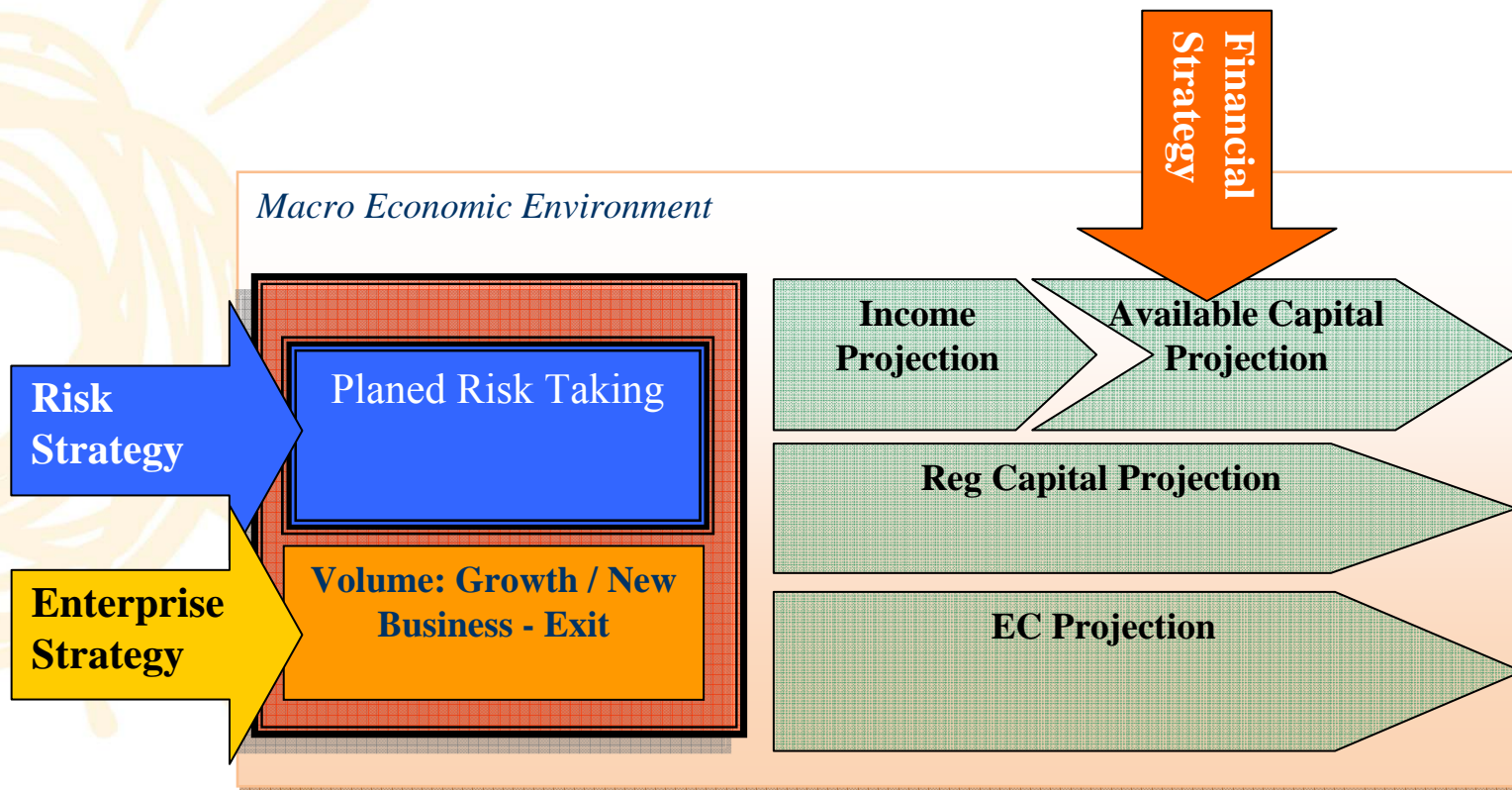
- RC Based: Tier 1 Ratio, 200% MCCR, SCR – 99.5%
- EC Based: Economic Capital/ Available Capital, Available Capital - EC

Base case: "Expected" Capital Adequacy

Key Measures		2011 Actual	Projection		
			2012	2013	2014
Available Capital	Tier 1	25	26	28	30
	EC (Pillar I+Pillar II)	20	23	24	26
Risk Capital	RC	18	21	22	23
	Tier 1 Ratio Forecast	11.1%	9.9%	10.2%	10.4%
Forecasted Capital Adequacy	EC/Available Capital	80%	88%	86%	87%
	Available Capital - EC	5	3	4	4
	Tier 1 Ratio	8.5%	8.5%	8.5%	8.5%
Risk Appetite (Min)	EC/Available Capital	90%	90%	90%	90%
	Available Capital - EC	3	3	3	3
	Tier 1 Ratio	8.5%	8.5%	8.5%	8.5%

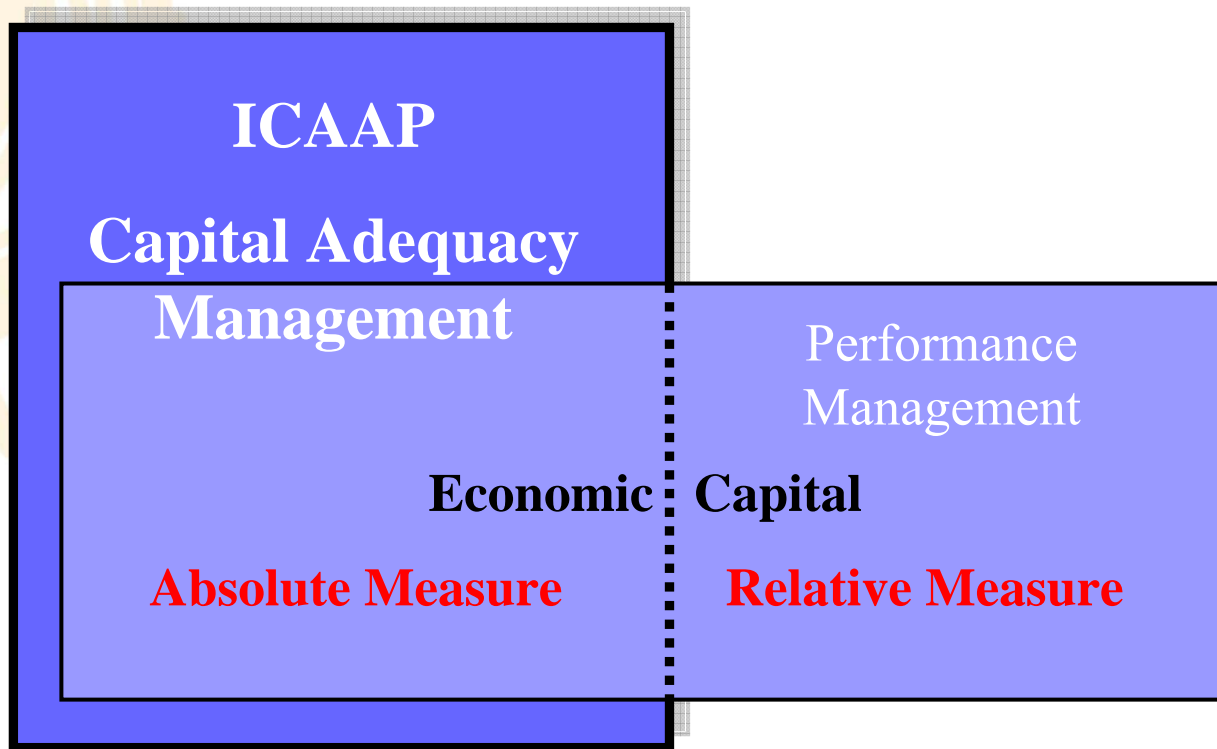
- Risk Strategy is the driver for both Available and the risk Capital
- How does Surplus Capital reconcile with our Risk Appetite and Corporate strategy?

Drivers of Supply and Demand – Base Case



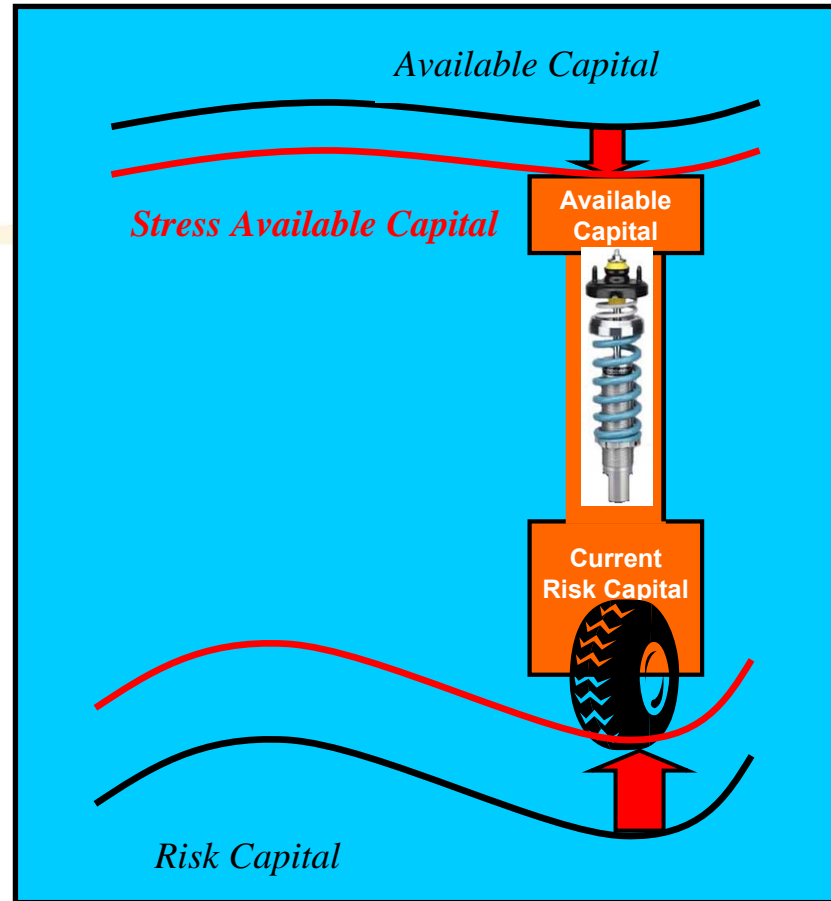
The role of Economic Capital

- A robust and well validated EC is a fundamental building block of ICAAP, used for managing the Capital Adequacy of the Bank
- It is also an invaluable tool in capital optimization among the Bank's LOBs, risk adjusted performance measurement, portfolio and limit management.



ICAAP Design – Stress Testing

- The buffer between “Available Capital” (the supply) and “Risk Capital” (the demand) is squeezed from both sides under stress.



Capital Adequacy under Stress, an example

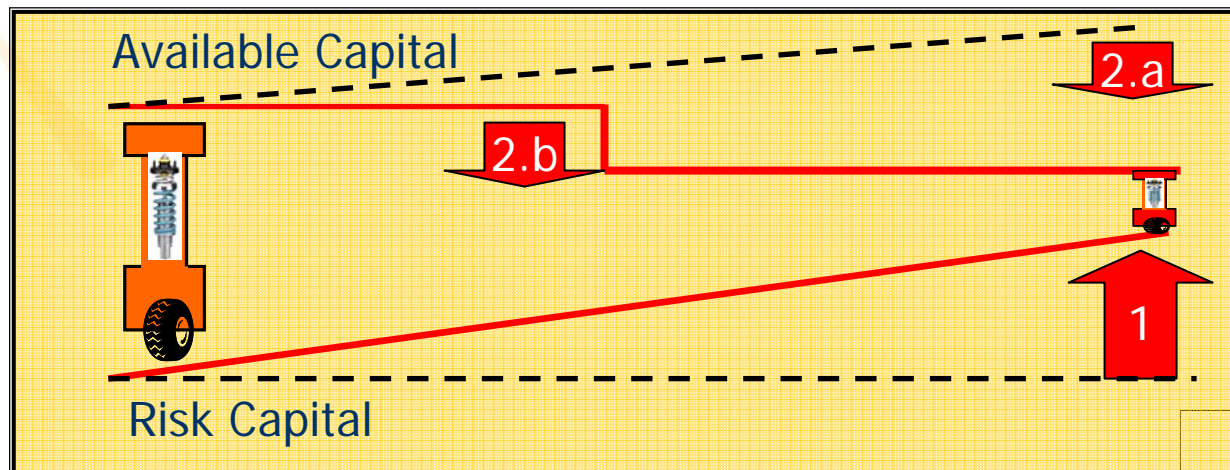
Key Measures		2011 (Usage)	Projection		
			2012	2013	2014
Available Capital	Tier 1	25	26	27	27.5
Risk Capital	EC (Pillar I+Pillar II)	20	24	26	27
	RC	18	22	24	25
Forecasted Capital Adequacy	Tier 1 Ratio Forecast	11.11%	9.45%	9.00%	8.80%
	EC/Available Capital	80%	92%	96%	98%
	Available Capital - EC	5	2	1	0.5
Stress Risk Appetite (Min)	Tier 1 Ratio	8.00%	8.00%	8.00%	8.00%
	EC/Available Capital	95%	95%	95%	95%
	Available Capital - EC	1	1	1	1

- Under severe stress, capital surplus would decline, can we weather the storm?
- Management Action?

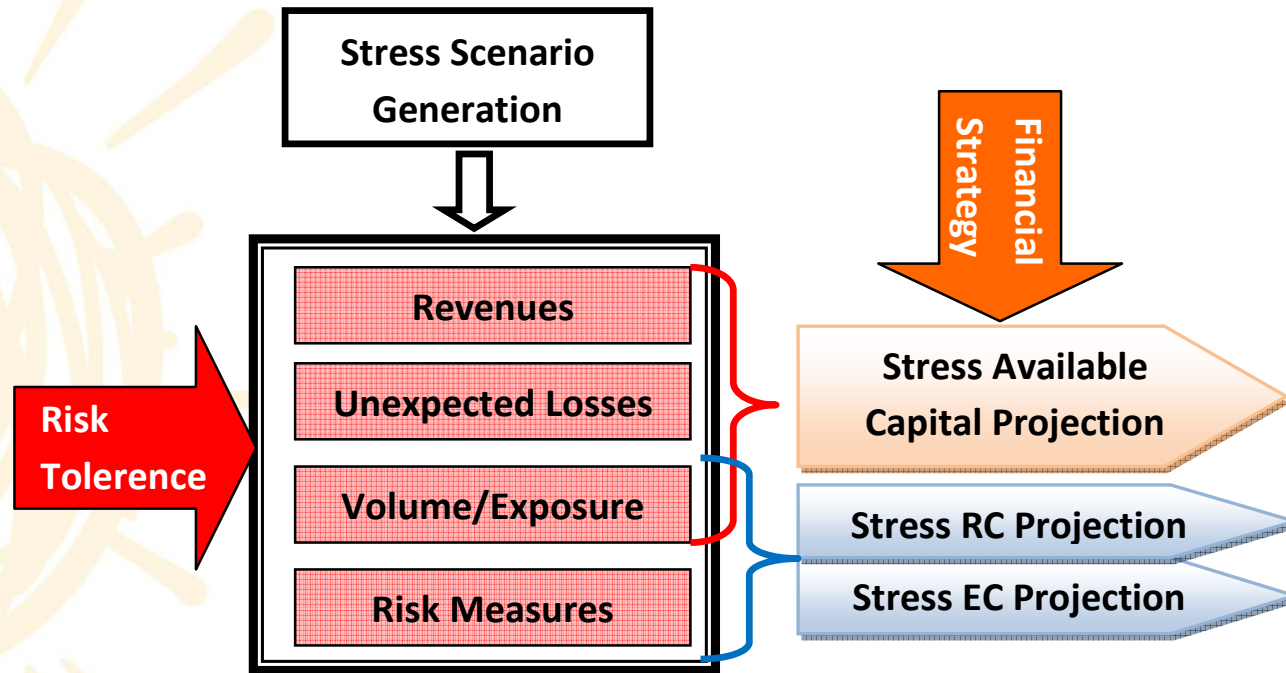
Impact of Integrated Stress Impact on Solvency

Scenario impact needs to be quantified *consistently* for (increase) in Risk Capital (EC and Reg Cap) and (decrease) in Available Capital (via reduced Net Income).

1. Integrated EC and Reg Capital (representing the increase in Capital Demand after the stress event)
 2. Integrated NI decline
 - a) Reduced fee income under stress (representing the decline in available Capital build-up due to the stress event)
 - b) Unexpected losses (representing the *usage* of Capital due to the stress event)
 - Some risks are always PIT (e.g. default) but how about MTM losses? Note $NI=f(\Delta Reserves)$
- Risk reduction, capital conservation, other management actions?



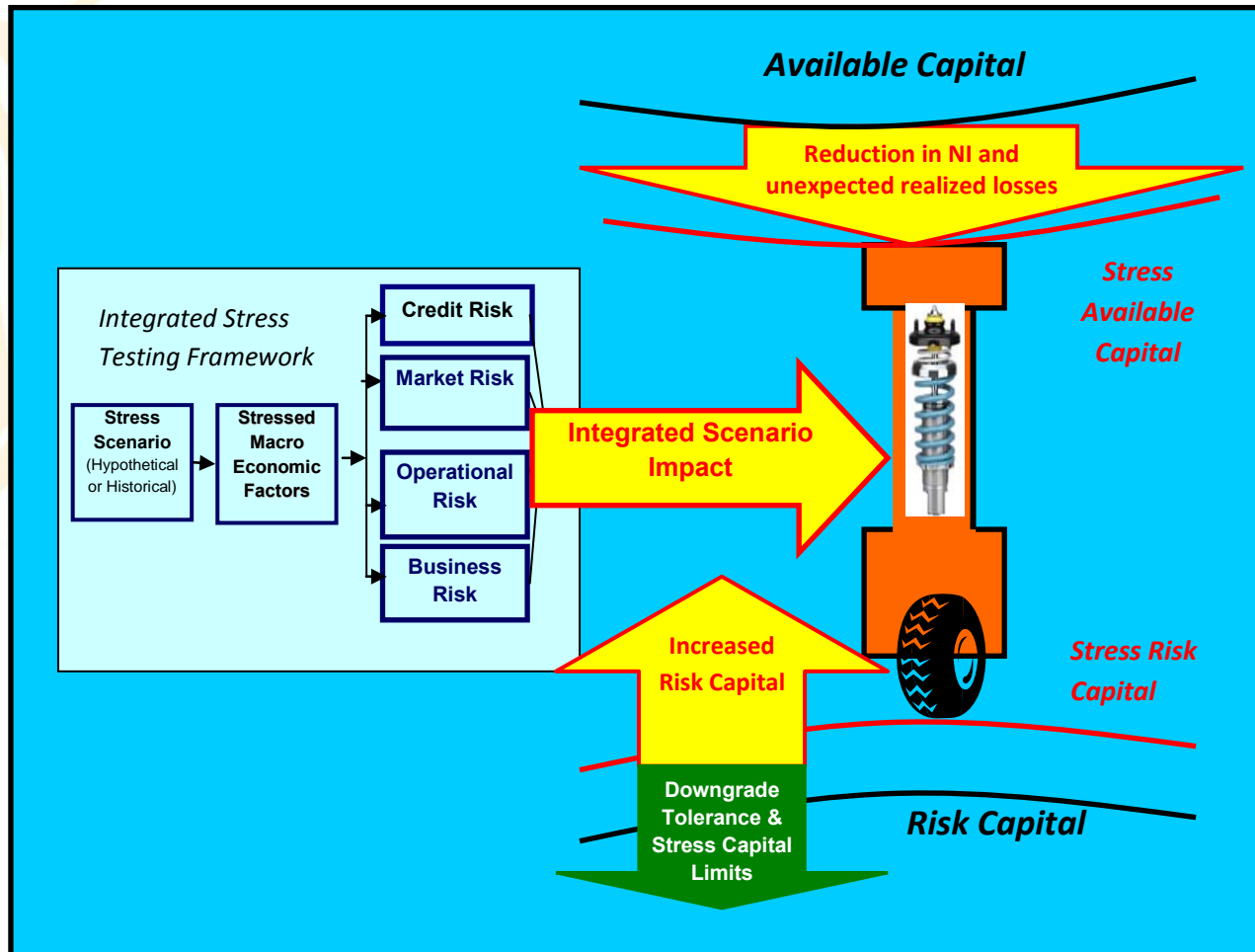
Drivers of Supply and Demand – Under Stress



- The FI's Risk Tolerance and Risk Management practices determines the vulnerability to stress
- Term Risk, Stress EC/RC limits? $\frac{\Delta EC}{\Delta GDP, \Delta r, \Delta \mu} = ?$
- Volume (anticipated portfolio volumes under stress; FIs with good risk management practices may be able to reduce their exposure size before the downturns)

Stress Testing

- Integrated stress test results help determine the impact on both Available and Risk Capital

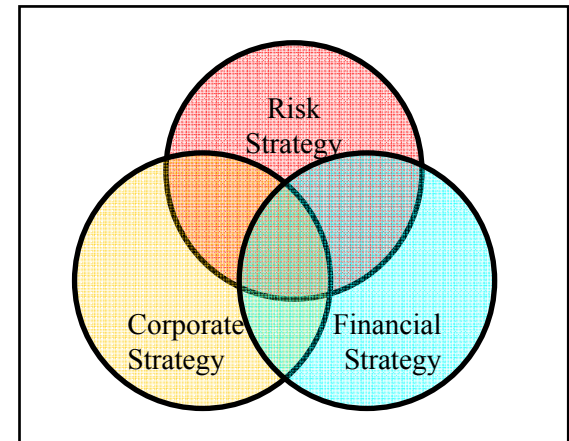


ICAAP/ORSA Design – Stress Testing

- **Selection of Stress Scenarios:**
 - Pessimistic scenarios within the normal course of business, and thus the bank needs to hold capital to guard against these stress scenarios.
 - Scenarios considered in ICAAP should represent the risk against which the capital is an effective mitigant
 - War Games represent the risk against which the capital is not necessarily an effective mitigant and thus the risk needs to be studied to understand the common fault lines and mitigated if needed. “Reverse scenarios”
- **Risk Appetite:**
 - Tier 1 Ratio under stress
 - Economic Capital / Available Capital under stress
 - Downgrade tolerance: Confidence Level
 - Stress Capital Limits: Ability to reduce risk taking
- **Forward looking conditional scenarios**
- **Coverage:** PDs, Migration Rates, Correlations, LGD, different portfolios and risk types

Turning ICAAP/ORSA into a Competitive Advantage

- Provides a new look for a consolidated and holistic view of risk and capital *“management”* by:
 - Integrating 3 important disciplines together: Risk, Finance and Strategy, facilitating internal communications, creating a common language
 - Integrating risk types and measures and linking them to capital adequacy management
 - Providing Transparency and Replicability to capital management
 - Providing a comprehensive framework for risk, including liquidity and capital management, taking it beyond EC
 - Facilitating important internal discussions such as on Risk Appetite
 - Increasing the reliability and the robustness of the Capital Management Framework, including EC, Stress Testing and their parameters
 - Increased preparedness and awareness for stress situations
 - Regaining regulatory and stakeholders' confidence
- **Let's not use ORSA/ICAAP as an after the fact reporting check-box, but a proactive management tool!**

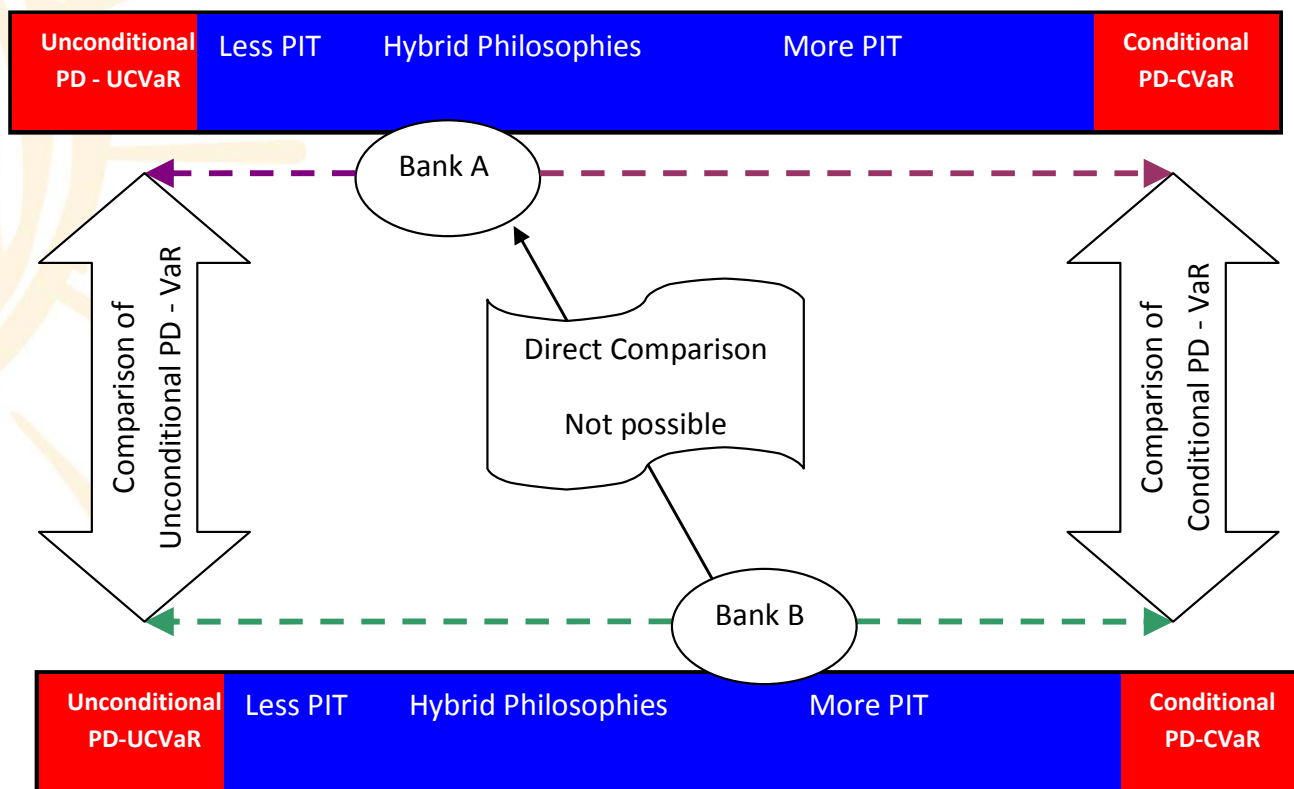


Procyclicality Problem

- **Basel II's objective of making the risk capital more risk sensitive comes at the expense of the procyclical capital requirement which amplifies the systemic risk. Dilemma:**
 - Risk Measures and Capital measured conditional on the business cycle preserves the time dimension of risk and provides directional information
 - However stability of Capital is desired for the longer term capital planning
- **Two solutions reconciling these objectives. They require no adjustment to the FI's existing risk rating practices and philosophies:**
 1. **Cyclical Confidence Interval:** tying the confidence level to the target debt rating more accurately, and by doing so keeping the benefits of forward looking risk information while dampening the procyclicality of capital.
 2. **Decomposing Risk Capital into its conditional and unconditional elements** in comparison with its Available Capital counterparts to obtain both shorter and longer views of capital adequacy and a forward looking view of risk. The only way to ensure an "apples-to-apples" comparison of capital adequacy among different financial institutions.
- **The issue can only be meaningfully discussed in the more encompassing Pillar II framework where both Risk Capital and "Available Capital" are examined**

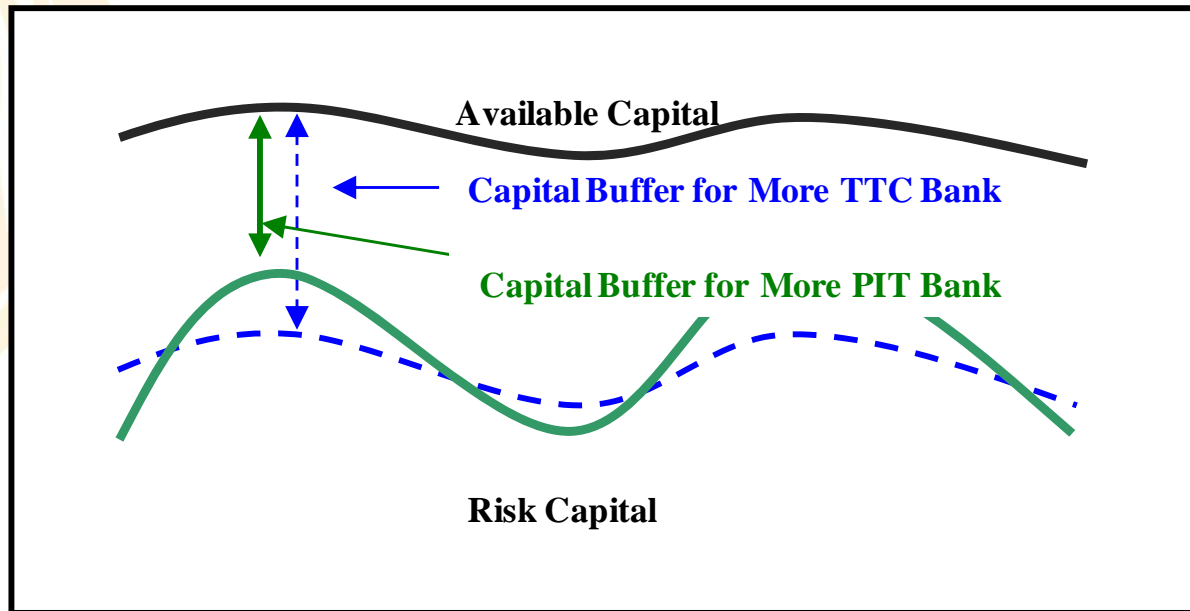
The Role of Risk Rating Philosophy

- Capital adequacies (measured in Tier 1 Ratio or Economic Capital / Available Capital) of FIs adopting different risk philosophies are not directly comparable



The Role of Risk Rating Philosophy

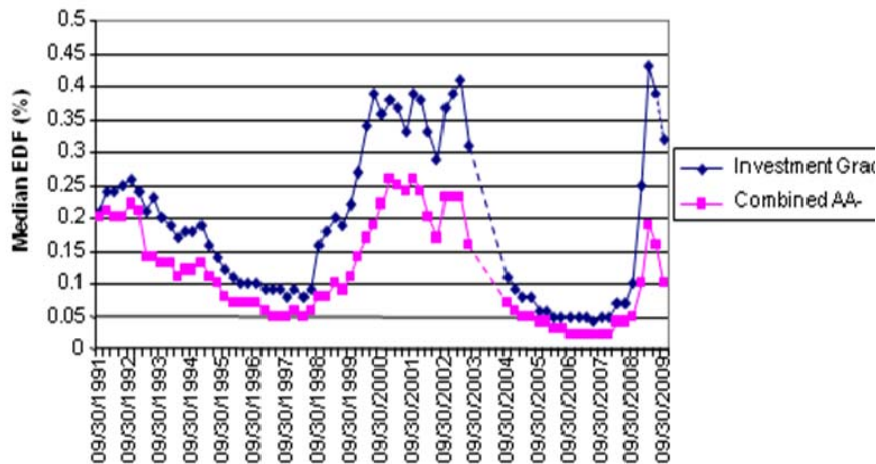
- Without Correcting for the different Level of PITness in the Risk Capital, Capital Buffers cannot be compared



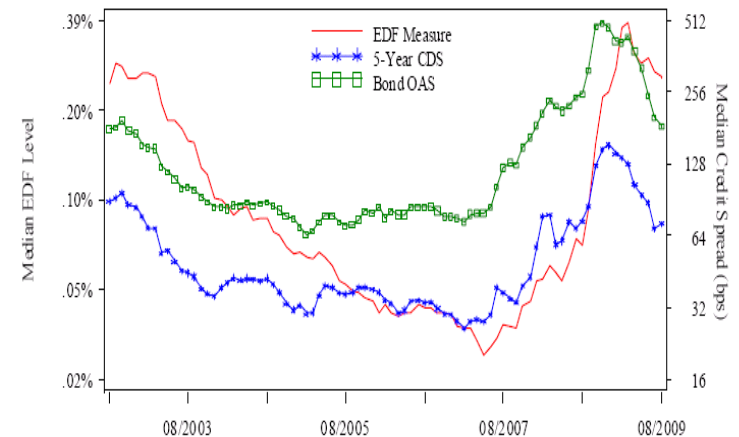
Solution #1: Stabilizing Risk Capital

- Targeting External Risk Rating vs. Targeting Probability of Insolvency
- What does Target Debt Rating imply?
- Rating Agency Methodologies?
- Probability of Insolvency is cyclical for a given target rating

Change in EDFs over Business Cycles

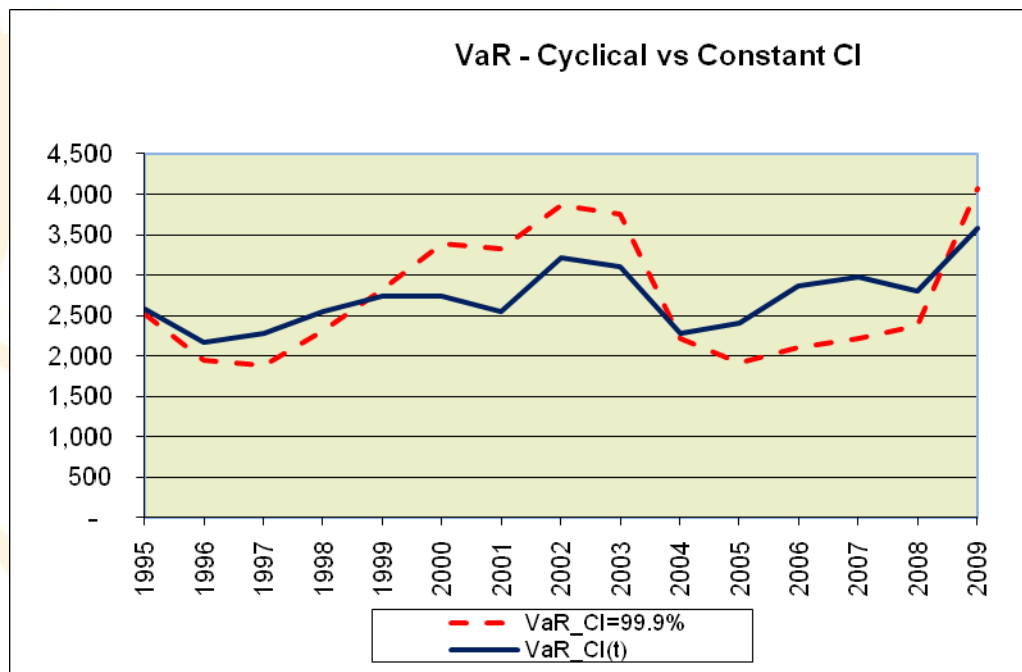


Investment Grade



Solution #1: Stabilizing Risk Capital

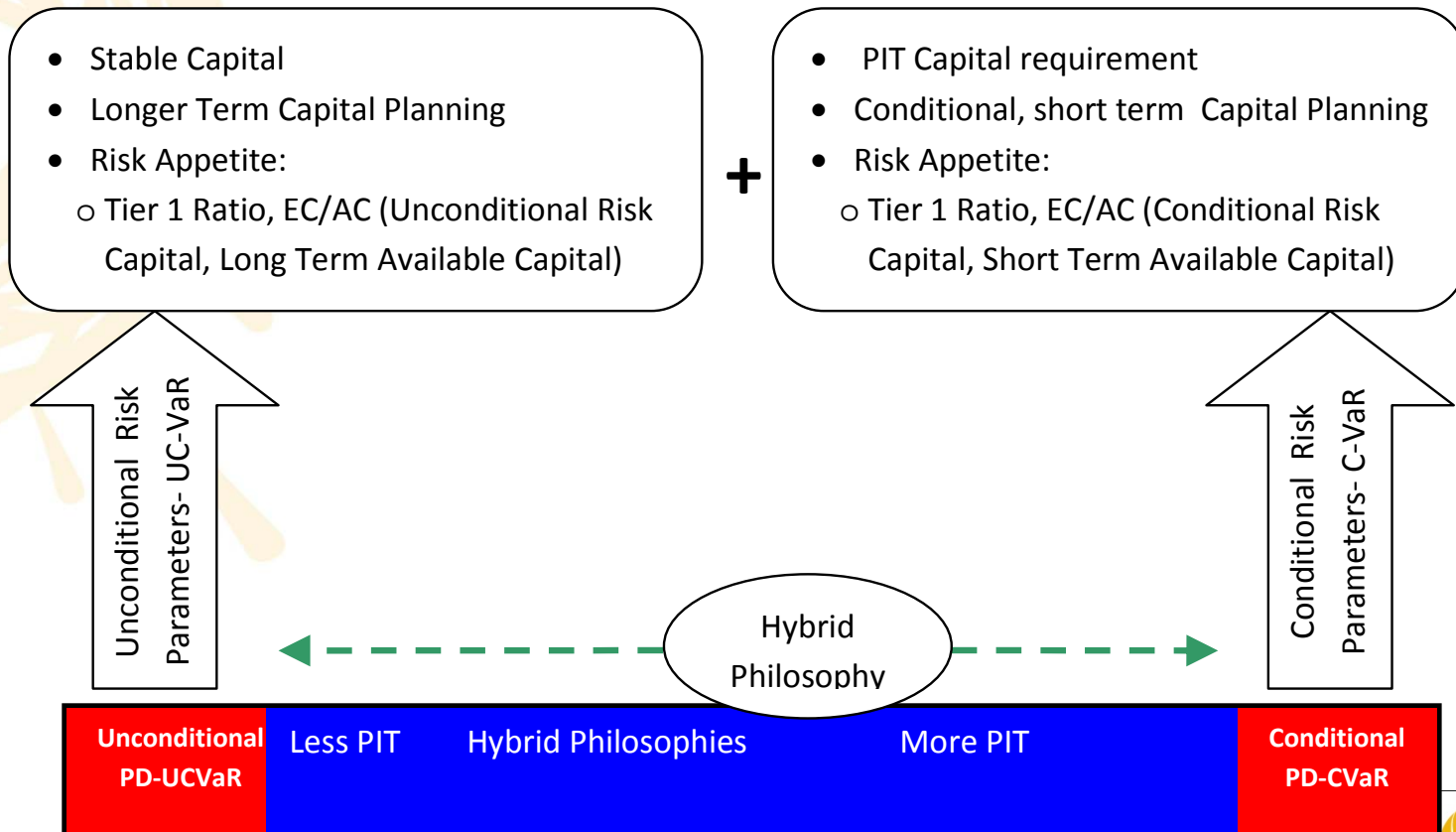
- Use of the Cyclical Confidence Interval dampens the procyclicality. Volatility of Capital is reduced almost by half while its long-run average is preserved.



- Needs to be supplemented with conditional stress testing

Solution #2: Achieving a comprehensive assessment by computing both Conditional and Unconditional VaR

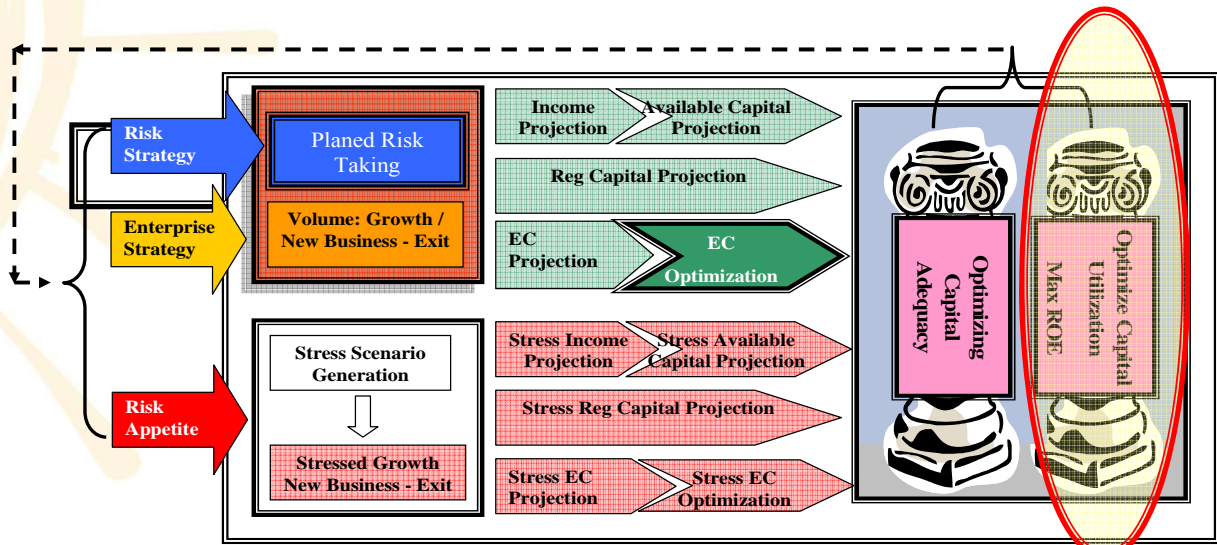
- Decompose Risk Parameters into their conditional and unconditional elements to calculate Conditional (PIT) and Unconditional VaR
- Risk Appetite is defined both conditionally and unconditionally.
- Refer to the paper for the analytics



Solution #2 - Advantages

- **Financial stability is best addressed in this dual framework where both conditional and unconditional Capital Surplus, as the difference between Risk and Available Capital, is defined in the Risk Appetite and managed against it.**
 - During the downturns, as Conditional (PIT) Risk Capital increases, we can monitor and manage this within the PIT Risk Appetite.
 - During the expansionary times, when PIT Capital Surplus enlarges, the unconditional view of Risk Appetite becomes the constraint, restraining excessive risk taking.
 - Moreover, (PIT) Risk Capital provides very valuable forward looking directional information for the risk and capital management.
 - On the other hand, unconditional risk capital is free of the procyclical nature of its conditional counterpart and thus allows FIs to manage their capital levels with respect to their long term strategic objectives.
- **Framework also provides an apples-to apples comparison among FIs**
- **An alternative to Basel III, See Appendix 1 for a comparison.**
- **Issue can only be discussed meaningfully in a Pillar II Framework !**

Managing Capital Utilization



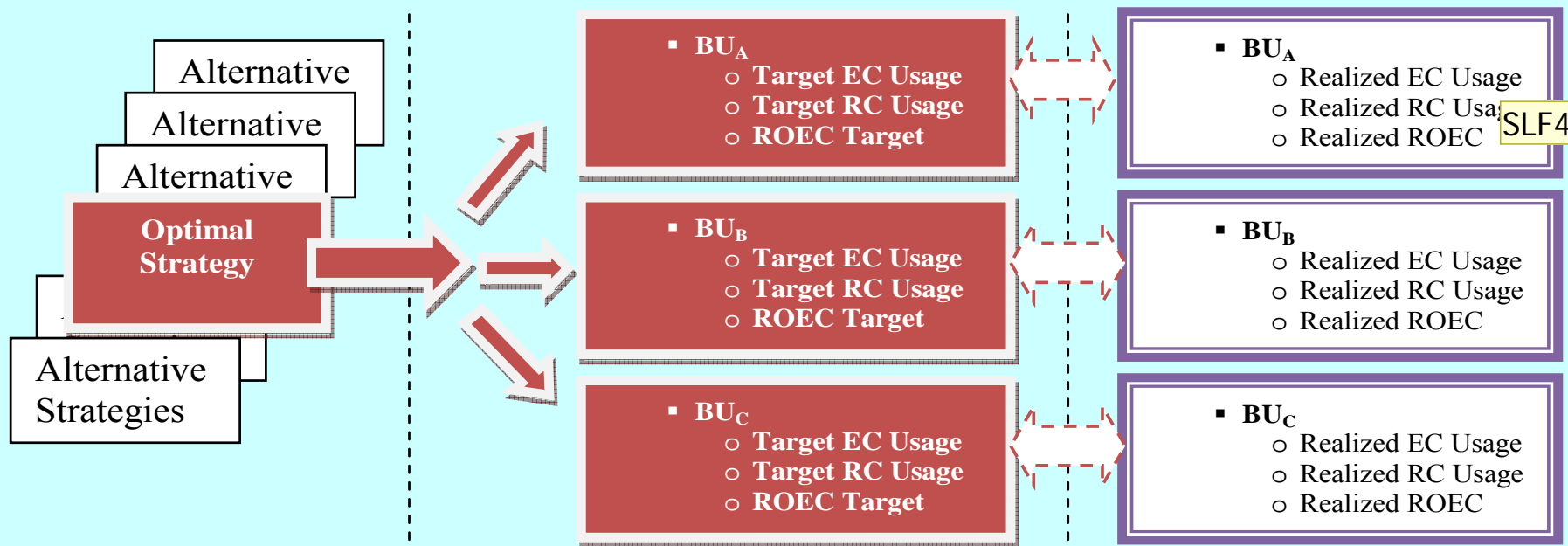
Enterprise View at Corporate Level

Motivation and the Environment

- Capital is more scarce
- Regulatory capital is more of a binding constraint
- Need to ensure Solvency/Capital Adequacy
- Need to manage capital and business mix more effectively
- Need to course correct especially in terms of business mix
- FIs traditionally Income driven
- How to set up the optimization problem for capital utilization and how to operationalize it?

The implementation ICAAP and ORSA frameworks facilitated the segregation of Capital as Available Capital (Supply) and Risk Capital (Demand). On the demand side, this necessary segregation has made the Risk and Capital relationship very direct where **Risk Strategy** is the driver of "Risk Capital or Capital Demand". This requires the Risk Function to take the lead in determining the Risk Strategy, own the Risk Capital and become an active partner in capital management.

3 Step Operating Model



Strategic Planning

Optimal Strategy is selected among alternatives

Target Setting

For the selected Strategy the following targets are set per BU

1. Target $ROEC_i$
2. Target EC_i Usage
3. Target RC_i Usage

Limit and Performance Monitoring

For each of the BU business Units the following is monitored

1. $Realized\ ROEC_i \geq Target\ ROEC_i$
2. $Realized\ EC_i\ Usage \geq Target\ EC_i\ Usage$
3. $Realized\ RC_i\ Usage \geq Target\ RC_i\ Usage$

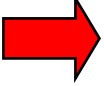
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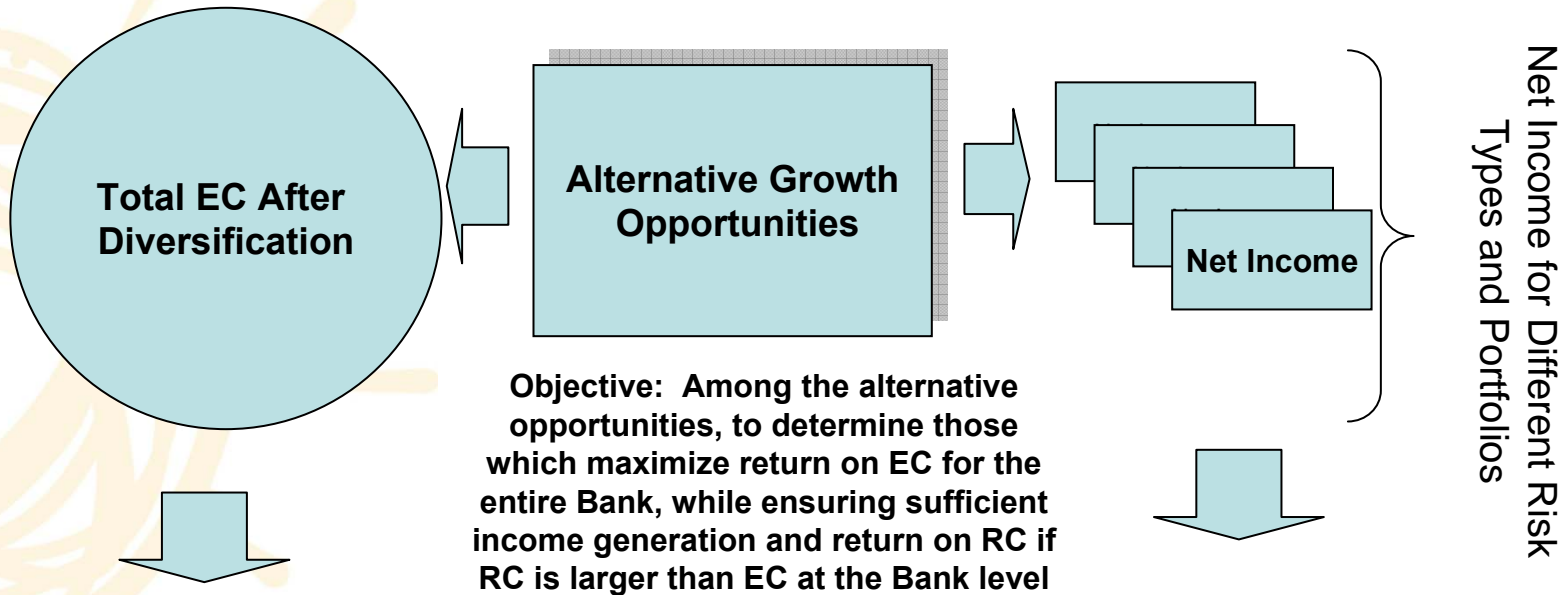
- Is there a space between "Optim" and "al"?

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Use of EC in Strategic Planning Process: Background

- **One way to approach the problem:**
 1. Starting Point  Target Net Income
 2. Allocate The Target Net Income among LOBs, to determine LOB level Target Income
 3. Determine the required “growth” for LOBs to support the required Target Income
 4. Given the growth rate, calculate the capital required to support the businesses
 5. Capital usage is the “**outcome**” of the process
- **But: how do we know we are using our capital most effectively?**
 - There are alternative ways of achieving total target income for the bank and some are more capital efficient than the others – due to larger diversification benefits – which EC can capture
 - EC is the right tool for this optimization (used in the *objective function*)
 - We need to take RC into account as a “constraint”, ensuring that an adequate rate of return is provided to the shareholders at the aggregate bank level (Note that EC and RC will be different for the LOBs)

Setting up the Optimization Problem



<p>Maximize Net Economic Profit</p> $\max \left(\sum_i^n E[NL_i] - \sum_i^n [k_i \times E[EC_i]] \right)$	<ul style="list-style-type: none"> • Subject to Total NI exceeding Target • Subject to Return on Maximum of EC & RC at the Corporate Level exceeding the Hurdle • Subject to Strategic Considerations 	<p>EC & RC Limits</p>
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Setting up the Optimization Problem

- We have income targets to meet

$$\sum_i^n E[NI_i] \geq N$$

- Growth determines both Income and Capital Usage

$$NI \Leftrightarrow \text{Growth} \Leftrightarrow EC$$

- Some ways of achieving the target Income are more capital efficient than others.
- The objective is to maximize NEP for the entire bank by allocating different amounts of EC among the LOBs while achieving the target income for the entire bank

$$\max \left(\sum_i^n E[NI_i] - \sum_i^n [k_i \times E[EC_i]] \right)$$

Why EC not RC?

- We need to take RC usage into account, ensuring that despite the differences between EC and RC for the LOBs, an adequate rate of return is provided to the shareholders at the aggregate bank level.

$$\frac{\sum_i^n E[NI_i]}{\left(\sum_i^n E[EC_i] + \sum_i^n E[RC_i] \right)} \geq \bar{k}$$

Role of RC in optimization: A Stylized Example

- During the strategic planning phase, we will optimally allocate our capital while taking into account the maximum of EC and RC at the Bank level as constraint.
- Although we will maximize return on EC, some RC friendly businesses will stay in the mix due to their ability to create RC room for those businesses which are contributing high return on EC. These businesses are likely to have a lower return on EC
- In the example below:
 - Business BL_A and Business BL_B are more profitable. But they cannot exceed the corporate hurdle rate without BL_C, i.e. $(10+10) / (100 + 150) = 8\% < 10$. With the inclusion of BL_C, the bank meets the constraint (30/300).
 - Performance of the businesses should be measured against the target (planned) ROEC. For example for BL_C:

$$\frac{NI(Actual)}{EC(Actual)} \geq \frac{NI(Plan)}{EC(Plan)} = 7.1\%$$

	BL_A	BL_B	BL_C	Total
NI - Plan	10	10	10	30
RC - Plan	100	150	50	300
EC - Plan	100	50	140	290
ROEC - Plan	10%	20%	7.1%	10.3%

If BL_C can return 7.1% ROEC at the end of the year, its mission is accomplished

Empirical Analysis, portfolio details

- Fairly typical (Canadian) bank portfolio

	Large Corporate	SME	Retail
Exposure	37%	18%	45%
EC	55%	25%	20%
EL	24%	27%	49%

- Differentiated hurdle rate

r_f	1%		
$r_m - r_f$	7.2%		
β	1.67	1.32	1.04
k_i	13.0%	10.5%	8.5%
	Large Corporate	SME	Retail

- Constraints for growth and contraction rates of exposure over the next year:

	MIN	MAX
Large Corporate	-10%	30%
SME	-15%	25%
Retail	-15%	20%

Empirical Analysis, "Risk Strategy"

- **Income Target over the next year is \$4.00 billion (*).**
- **Alternative Risk Strategies:**
 - Scenarios 1-4: Maintain the existing risk profile. Generate extra income via portfolio growth.
 - Scenarios 5-8: Uniform increase in risk profile to generate extra (spread) income.
 - Scenarios 9-10: Non-uniform increase in risk profile to generate extra (spread) income.

(*) If the bank maintains its current exposure, and risk profile, it can expect to have income of \$3.72 billion over the next year.

After expenses but before EL

Results

- Although all scenarios produce \$4.00 billion income, NEP and ROEC differs materially

Panel A: NEP

Scenario #	Large Corporate	SME	Retail	Combined
1	2	7	481	491
2	31	15	477	523
3	(193)	(5)	360	162
4	(26)	0	427	402
5	(57)	(25)	386	304
6	(244)	8	401	166
7	9	(99)	403	313
8	4	(46)	271	230
9	(72)	36	484	448
10	(157)	(93)	306	56

Maximum Reduction in Large Corporate portfolios

Panel B: ROEC

Scenario #	Large Corporate	SME	Retail	Combined
1	13.03%	10.6%	22.5%	14.3%
2	13.4%	10.8%	23.2%	14.5%
3	11.6%	10.4%	21.9%	12.7%
4	12.8%	10.5%	22.2%	13.8%
5	12.5%	10.0%	20.8%	13.3%
6	11.0%	10.7%	22.6%	12.7%
7	13.1%	8.7%	22.8%	13.3%
8	13.05%	9.4%	15.5%	12.7%
9	12.3%	11.3%	24.7%	14.2%
10	11.6%	8.6%	17.7%	11.9%

Observations

- **Correlations matter.** Certain combinations result in larger diversification benefits. For example, the difference in EC between Scenarios 1 and 2 are partially due to the increased diversification benefit in Scenario 2.
- **To improve the overall bank's NEP, the Large Corporate portfolio must contract in size.** The Large Corporate portfolio has a very good NI/EL ratio (due to low PDs) but suffers from high EC due to high correlations. It neither can handle an increase in exposure (Scenario 3) nor an increase in riskiness (Scenarios 5, 6, 9, 10). However, the annual contraction rate is limited to 10%.
- **Retail is a good area of growth for this bank.** However, it is limited to 20% growth annually. While the exposure increase does cause NEP to grow significantly, it does not respond as well to moving up the risk curve - due to a further increase in EL which is already substantial given the higher average PD of the business. For moving up the risk curve, there is room for increasing the risk for RR 1 to RR4 (Scenario 9) but not the other way around (Scenario 10).
- **SME portfolio does not lend itself well to the moving up the risk curve** as the already high EL increases too much.
- **The fact that neither the SME nor Retail portfolios benefit from an increase in risk levels of the portfolio is an interesting finding. As in these portfolios, the growth in business is typically achieved at the expense of an increase in risk.**
- **Constraints on growth/contract or, more precisely, the need for income, diminish the ability to *course correct*.** The bank can choose to reduce its Large Corporate business faster than 10% annually but as the retail business cannot grow fast enough to replace the income loss from this reduction, the bank would fall short of its income target. To course correct faster towards a more optimal business mix, income sacrifice is needed in the shorter term.

Observations - Impact of Basel III

- Under the above scenarios, we do not violate the constraint that the return of the maximum of total EC and total RC is higher than 11.6% (the weighted average cost of capital of this bank).
- However under the Basel III regime, a significant increase in RC is likely. For example, under the bottom of the cycle calibration, RC can go up by 60% for Large Corporate, and by 20%-25% for retail and SME portfolios. When we recalculate RC under these potential increases:
 - for all of the scenarios, RC now exceeds EC significantly
 - the return (on Maximum of total EC and total RC) is less than the bank's weighted average cost of capital of the bank, for all scenarios but Scenario 9 (because RC is less sensitive to the risk increase in investment grade obligors in Risk Rating 1 to 4 on a relative basis, RC does not go up as much, making Scenario 9 the only viable scenario exceeding the constraint)
 - because we can no longer utilize Scenario 2 which provides the best economic alternative, Basel III results in an economic cost. The more RC exceeds EC at the aggregate level, the higher the cost.

Scenario #	Pre-Basel III	Basel III
	$\Sigma(\text{NI-EL})/\text{Max}(\Sigma\text{EC}, \Sigma\text{RC})$ (%)	$\Sigma(\text{NI-EL})/\text{Max}(\Sigma\text{EC}, \Sigma\text{RC})$ (%)
1	14.3	11.4
2	14.5	11.3
3	12.7	10.7
4	13.8	11.3
5	13.3	11.0
6	12.7	10.6
7	13.3	10.9
8	12.7	10.3
9	14.2	11.7
10	11.9	9.9