

3 Oct 2007

ICA Model Validation:
More Than Just Passing the Use Test

Don Mango, FCAS, MAAA
Morristown, NJ USA
mango@guycarp.com

www.guycarp.com

Agenda

- Use Test Frameworks
- Issues
- Considerations
- Principles
- In-Depth Review of Internal Model Standards
- Q & A

Internal Model Usage Frameworks

- FSA
- Lloyd's
- ABI (+IUA-ILAG-Lloyd's-Lloyd's Market Association)
- IAA
- CEIOPS
- IAIS
- CRO Forum
- S&P
- Moody's
- Fitch
- AM Best



I Am Losing It
It's 5 pm and I am Jet-Lagged

- "Valid" is a loaded term
 - Like *Coherent Risk Measures*
 - It is in the eyes of the beholder
- We need a fresh perspective on this
 - Less soporific
- I am not expert in Solv 2 or ICA
- I have (unsuccessfully) implemented two large ICA's in multi-national firms before there were any regulatory or rating agency frameworks
- I alone know what is valid

How about a Quiz?

Use Test Quiz
Don't Be Shy (and Don't Lie)

- My firm's senior management have _____ faith in our ICA Model
 - *complete and utmost*
 - *a smidge*
 - *a tad*
 - *be serious*
- I pulled the correlation figures from _____
 - *ahem*
 - *this is a family show*

Guy Carpenter

6

Use Test Quiz
Don't Be Shy (and Don't Lie)

- My firm's senior management team have a _____ set of risk preferences, tolerances and appetites
 - *well-developed, well-understood*
 - *fluid*
 - *Bayesian*
 - *is this being recorded?*
- My firm's Board drives risk management _____
 - *from the top down with a firm hand*
 - *like Helio Castroneves*
 - *right off a cliff*

Guy Carpenter

7

Use Test Quiz
Don't Be Shy (and Don't Lie)

- Our ICA Model represents _____
 - *the official risk record of the organization*
 - *our best guess*
 - *the bare minimum to pass muster*
 - *an opaque actuarial exercise (oxymoron?)*
- We have integrated our ICA Model _____
 - *into planning, pricing, and performance assessment*
 - *From 0 to ∞*
 - *into our ICA process*

Guy Carpenter

8

Use Test Quiz
Don't Be Shy (and Don't Lie)

- Our ICA Model has been validated _____
 - using industry standard statistical techniques like backtesting
 - for a reasonable fee
 - by following the IAIS published standards
 - ...I mean IAA
 - ...I mean FSA
 - ...I mean CEIOPS
 - ...I mean CYCLOPS

Model "Validation"
The Three-Fold Path

- Your ICA Model should be worth using (in your opinion) ▪ *Right Model*
- Your ICA Model should be perceived to be worth using (in management's opinion) ▪ *Right Communication*
- Your use of the ICA Model should improve company risk management and (ideally) performance ▪ *Right Application*

ICANIVARA



Right Model
AKA "Internal Validation"

**Improved ICA Model Usage
Depends on Four Fronts**

1. Educational – learning terminology, frameworks, practices from other industries
2. Organizational – modifying the way the company makes decisions
3. Political – managing the implications
4. Technical – the risk modeling

- **A Change Management process**
- **Improved ICA Model Usage requires coordinated progress on all four fronts**

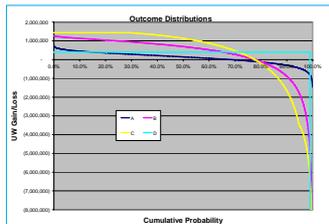
Internal Validation = “Buy-In”

- Passing the “Use Test” means
 - Management understands the capital model, can explain it, and believes in it enough to use it in major decisions
 - This will require a **base level of knowledge and comfort with probability**
- Lacking an absolute standard, ICA Model Validation is a **comfort building** exercise
 - Comfort comes from familiarity and repetition
- Messages to actuaries:
 - Some people do not have innate “number sense”
 - Some people need pictures not schedules
 - Multiple diagnostic indicators may be needed (**physicians**)
 - Indicators may conflict
 - You may be called upon to **make calls that impact the future of the firm**

**Comfort Building
Decision Variable Suite**

Ratios and Amounts

Line	A	B	C	D
Mean Return	100.068	302.162	409.450	300.000
Std Dev Return	318.540	1,269.227	1,699.199	995.495
CV Return	3.06	4.20	4.15	3.32
Median Return	144.002	693.499	1,130.575	400.000
1 in 5 Year Return	(130.186)	(165.723)	(198.929)	400.000
1 in 10 Year Return	(303.239)	(879.900)	(1,649.425)	400.000
1 in 50 Year Return	(665.659)	(3,383.339)	(4,963.725)	400.000
1 in 100 Year Return	(810.774)	(4,800.477)	(6,223.925)	300.000
1 in 250 Year Return	(993.253)	(6,968.127)	(7,984.105)	(9,600.000)
Upside U	286.767	777.502	1,131.773	400.000
PI(U)	68.0%	77.7%	77.6%	99.0%
Downside D	(254.168)	(1,354.067)	(2,092.885)	(9,600.000)
PI(D)	32.0%	22.3%	22.4%	1.0%
DIU Ratio	0.95	1.74	1.85	24.00
R/R	2.23	2.00	1.87	4.13
TVaR 99%	(1,028.893)	(7,720.816)	(8,259.425)	(9,600.000)



Tables and Charts

Increasing Internal Validation

- Solicit opinions but do not grant **veto rights**
- Ask "Can you live with this?" not "Are you fully satisfied?"
- **Mandate** the priority and timelines – will never happen bottom up
- Staged roll out – gradually move in the fences
- Be prepared on all four fronts
 - Anticipate political threats
 - ICA Model = Power
- Even though it is mandated by FSA, your firm still must go through the change management process steps **repeatedly with each additional wave of adoption**

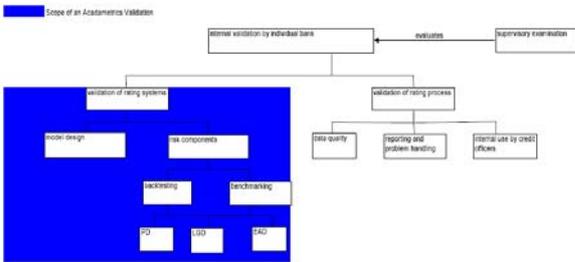
**Right Communication
AKA "External Validation"**

**Acadmetrics UK
Basel II Credit Model Validation**

"Model Validation - Overview

- **Validation Requirements**
 - FSA requirement for formal validation of internal models
 - full documentation & description – capable of "white room" replication or "judicial assessment"
 - rigorous validation of methodology, data & assumptions
 - full integration with risk management processes & senior management decision making
- **Issues**
 - **no formal FSA specification of validation methodology**
 - uncertainties of credit risk v market risk – risk horizon, data availability, asymmetric distributions
 - role of benchmarking & model replication"

Model Validation - Scope



The Six Principles of Validation



1. Validation is fundamentally about assessing the predictive ability of an institution's risk processes
2. The credit institution must have a clear understanding of its credit processes
3. Validation is an iterative process
4. There is no single validation model
5. Validation should encompass all quantitative elements
6. Validation processes and outcomes should be subject to independent review

And the banks are ten years or more ahead of us!

And have piles more data!

Four Key Issues

- Qualifications of Official Validators
 - FSA
 - CEA / CEIOPS
 - Principles-based regulation could be writing checks that cannot be cashed
- Qualifications of External Validators
 - Talent pool is thin
- Conflicts of Interest of External Validators
 - If they built they cannot validate
- Documentation of ICA Model
 - Time and resource to create it
 - Usefulness of 300 page Word documents

Right Application AKA "Validation by Performance"

Performance Testing

- Capital
 - Munich Re
 - Endurance
 - AIG
- Reward Appetite and Risk Tolerance
- Capital Allocation

Stock Firms Putting Their ICA to Use *With their Investors* *Munich Re Analysts Conference 4 May 2007*

Risk capital and risk mitigation

Economic capital requirements

Breakdown of Group required risk capital as at 1 January 2007

in €bn	1 January 2007		1 January 2006		▲ in %
	Stand-alone	Group	Stand-alone	Group	
Risk category*					
Reinsurance segment					
Property-casualty	8.2		7.9		+4
Life and health	2.6		2.7		-4
Market	8.1		8.1		-25
Credit	1.0		0.8		+25
Simple sum		19.9		19.5	+2
Segment diversification effect†		-0.4		-0.3	-14
Total reinsurance segment		14.5		13.2	+19
Primary insurance segment					
Property-casualty	0.4		0.5		-20
Life and health	0.7		0.4		+75
Market	3.2		2.7		+19
Credit	0.2		0.2		0
Simple sum		4.5		3.8	+18
Segment diversification effect†		-0.2		0.0	
Total primary insurance segment		4.3		3.8	+13
Group diversification effect†		-0.4		0.0	
Munich Re Group total		19.4		17.0	+18

Stock Firms Putting Their ICA to Use *With their Investors*
AIG EC Model Update August 2007

The initial results based upon year-end 2005 financial data supported management's view of AIG's overall capital strength and excess capital position. Excess capital is defined as the surplus of available economic capital over required economic capital. Analysis of AIG's firm-wide economic capital requirements using year-end 2006 financial data and certain enhanced methodologies affirms that at year-end 2006, on a conservative basis, AIG had excess capital in the range of \$15 billion to \$20 billion, as AIG has previously disclosed. Furthermore, year-end 2006 results reinforce management's view that AIG continues to generate excess capital as a result of its profitable diversified and global operations.

Stock Firms Putting Their ICA to Use *With their Investors*
AIG Share Buyback and Permanent Dividend Increase

**AIG ANNOUNCES NEW DIVIDEND POLICY
AND STOCK REPURCHASE PROGRAM**

New York, March 1, 2007 – American International Group, Inc. (AIG) announced today that its Board of Directors has approved a new dividend policy and common stock repurchase program.

The new dividend policy provides that under ordinary circumstances AIG's plan will be to increase its common stock dividend by approximately 20 percent annually. The new policy will be effective with the common stock dividend declared in May of 2007. In May of 2006 AIG raised its quarterly cash dividend 10 percent from 15.0 cents per share to the current quarterly dividend of 16.5 cents per share.

AIG's Board of Directors has expanded AIG's existing share repurchase program by authorizing the repurchase of up to \$8 billion in common stock. As part of this authorization, AIG intends to repurchase \$5 billion in common stock during 2007. It is

Reward Appetite and Risk Tolerance
Two Sides of One Coin

- Appetite = actively seek
 - My mother-in-law loves cheesecake ...
 - Investing in U.S. "sub-prime mortgages" gives a high yield...
 - We are moving into cat reinsurance...
- Tolerance = expect to withstand without changing course
 - ...but is lactose intolerant.
 - ...what happened?
 - ...but is the Board ready to pay losses?
- Japanese banks tend to have low risk appetite but high risk tolerance
 - Underwriting and trading activities are conservative
 - Tolerate large blowups without dismissals or business line shutdowns
- US banks are the opposite!
 - Underwriting and trading activities are aggressive
 - Inevitable large blowups lead to dismissals and business line shutdowns

Allocation of 2000-year VaR
Segment Contribution to 2000-year Result

In practice this means either:

- Assessing the **marginal impact** of each segment on the 2000-year result by marginally increasing the size of each segment and re-calculating the portfolio 2000-year result,

or

- **Decomposing** the 2000-year event itself to determine each segment's contribution to that event result

Issues:

- *Calculation-intensive*
- *How to increase a segment*
- *Not additive – every segment treated as “last-in”*
- *Model sensitivity – moving up or down one event in list can dramatically change loss*
- *Parameter uncertainty increases with return period*
- *Robustness – individual segment contributions can differ widely between events*

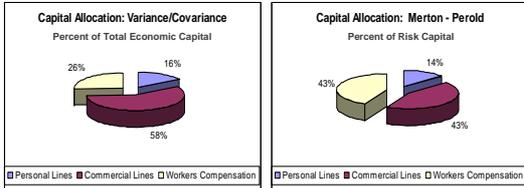
Capital Allocation Alternatives
Broader Interpretation of “Same Basis”

- Same basis can also mean **same underlying ICA model**
- Allocating on the strict interpretation implies the firm holds sufficient capital **“for”** the 2000-year VaR loss
 - Basis for allocating the cost of capital is impact solely in the extreme tail scenario
 - Like only prosecuting murder
- Broad interpretation implies the firm holds sufficient capital **“even for”** the 2000-year VaR loss
 - Franchise is also damaged from material partial losses of surplus
 - Credit Neil Bodoff of Willis Re for making this important distinction
- From a **ruin** focus to an **impairment** focus

Capital Allocation Alternatives
Method of Co-Measures or “RMK”

- RMK = **R**uhm **M**ango **K**reps
- A transparent way of allocating cost of risk or capital in an additive manner
- Additive – capital allocated separately to lines A and B will equal the capital allocated to lines A and B on a combined basis
- Straightforward to implement using cat model or ICA model output
- Numerous papers by GC experts on application of this method
- GC also have demo spreadsheets

Different Techniques ... Different Results



Justin Skinner, QBE UK: *most hated person in the firm*
 Why? Fallen to him to make capital allocation decisions

Alternative to Capital Allocation
Shared Asset Approach

- Charge each business unit for its right to access the capital of the company (capital consumption or shared asset)
 - Profit should exceed value of this right
 - Essentially an **economic value added** approach
 - Avoids arbitrary and artificial notions of allocating capital
 - Business unit has option to use capital when premiums plus investment income on premiums run out (company provides stop-loss reinsurance at break-even)
 - Company has option on profits of unit if there are any
 - Pricing of these options can determine economic value added
- Reference: Mango, "Insurance Capital As A Shared Asset," *ASTIN Bulletin* 35/2, Nov 2005
www.casact.org/library/astin/vol35no2/471.pdf

Model "Validation"
The Three-Fold Path

- Your ICA Model should be worth using (in your opinion) ▪ *Right Model*
- Your ICA Model should be perceived to be worth using (in management's opinion) ▪ *Right Communication*
- Your use of the ICA Model should improve company risk management and (ideally) performance ▪ *Right Application*

ICANirvana

