



Risk Based Capital- A Practitioner's Perspective

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What is Risk Based Capital?

- Using stochastic modeling techniques to assess capital requirements
 - Model each of the material risks that impact the company
 - Insurance
 - Market
 - Operational
- Model capital and profit impacts of the various company specific risks
- Assess the amount of capital required to meet stresses reflecting the company's Risk Appetite Statement
- Mainly used to set Target Surplus, but can form the basis for an approved internal model.



Why Risk Based Capital ?

- Captures non-linearity and combinations of risks
- Models embedded options and evaluates impact of hedging strategies
- Identify combinations of risks that can impact the company's solvency
- Can model the impact of some strategic options
 - Investment strategy
 - Reinsurance
 - Acquisitions and divestments
- Optimize Group Structures
 - Quantify diversification benefits
 - Capital Structure – evaluate alternative capital instruments.
 - Understand ICAAP relationships within a group

Differences with Regulatory Capital

- Regulatory capital is generally formula based and deterministic
 - Simplified underlying model
 - Simplified correlations
- RBC
 - Mainly used to calculate additional capital requirements.
 - Can be used for internal models (if approved)
 - “Realistic”
 - More flexibility in valuation of assets and liabilities
 - Often allows for many factors not allowed for in regulatory capital



Communication of Results

- RBC results can be difficult to understand and communicate
- The models are complex
 - Many assumptions
 - Complex interactions between insurance and economic variables
 - Volatility of results over time as assumptions vary
- Results need review and challenge
 - Series of discussions with senior management
 - Need careful thought in how to present the results and the underlying assumptions



Economic Scenario Generators

- Complex models
 - Linkages between various economic variables
 - 'Point in time' or 'through the cycle'?
- Model
 - GDP
 - Interest rates (usually a simplified term structure)
 - Credit Spreads
 - Stock markets
 - *Regime switching?*
 - Currencies
 - Property
 - Inflation
 - Other asset classes as needed
- Mean reversion?
 - Correlations
 - Normal or extreme situations where correlations are larger.

Insurance Scenario Generators

- Life Insurance Insurance Risk Charge allows for:
 - mortality and morbidity random stresses;
 - Mortality and morbidity future stresses;
 - event stress;
 - longevity stress;
 - lapse stress;
 - servicing expense stress; and
 - other insurance contingencies.
- How do we set distributions to these?

Insurance Scenario Generators

- For General Insurance
 - Claims volatility;
 - Catastrophes;
 - Frequency, exposure
 - Price inflation;
 - Benefit inflation, including legal induced inflation;
 - Legislative changes;



Operational Risk Generators

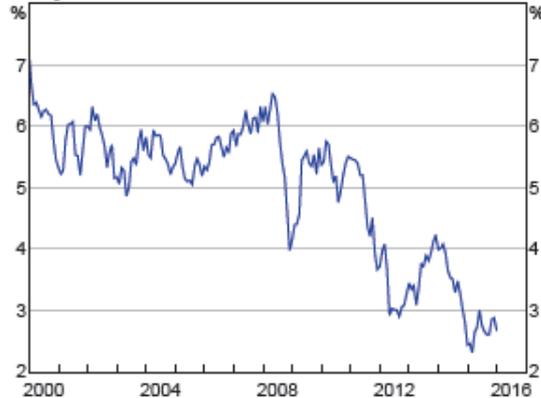
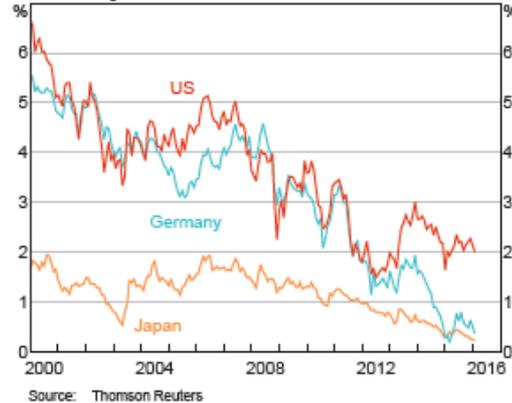
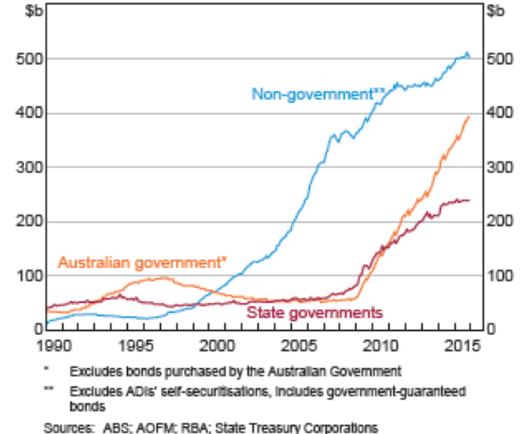
- How to calibrate?
 - Lack of data
 - Rapidly changing operational environments
 - Large operational risk events tend to come from unexpected events
 - Workshops with risk and business people
 - Fit curves



Calibration

- Long term v short term
- “Point in time” v “Through the cycle”
- Market based
- Systemic changes in markets – quantum of bonds on issue

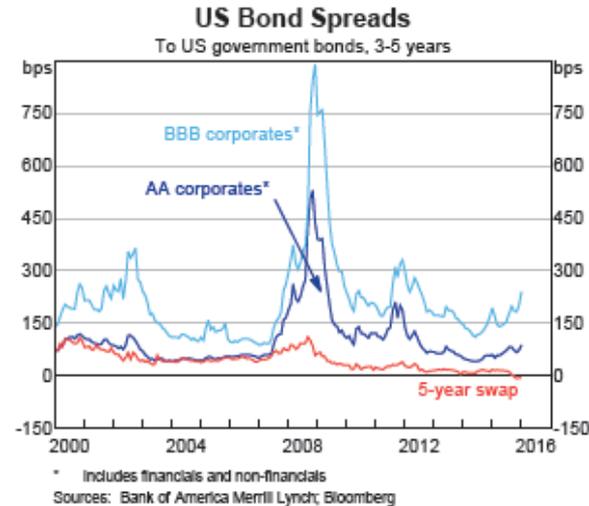
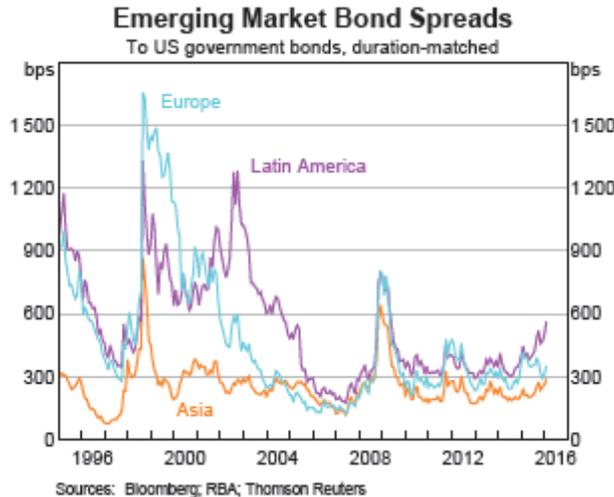
- **10-year Australian Government Bond Yield**

**10-year Government Bond Yields****Bonds on Issue in Australia**



Correlations & Diversification

- What correlations should we model?
- What was the event frequency of the GFC?



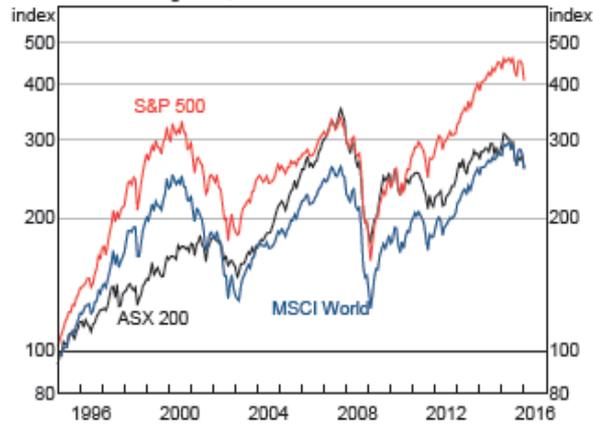


Stock Markets

- Various markets show correlations

Australian and World Share Price Indices

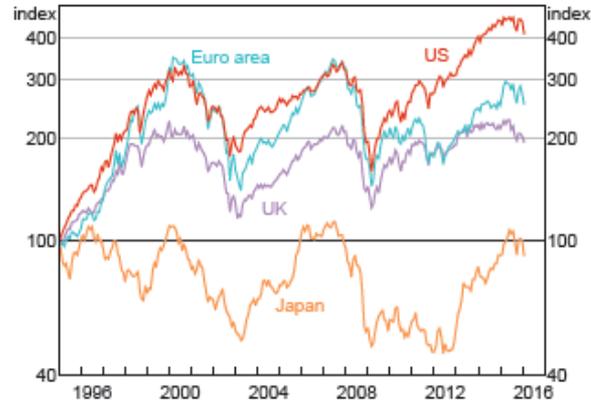
Log scale, end December 1994 = 100



Sources: Bloomberg; MSCI; RBA

Major Economies' Share Price Indices

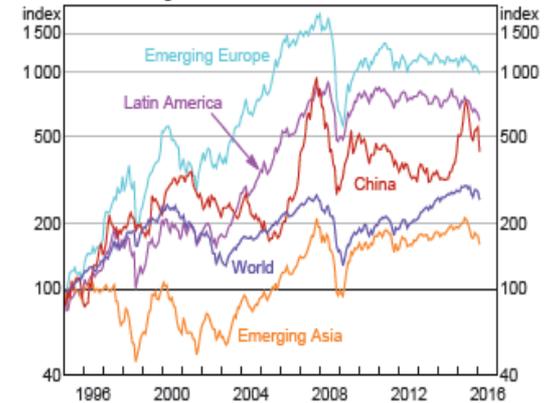
Log scale, end December 1994 = 100



Sources: Bloomberg; RBA

Share Price Indices

Log scale, end December 1994 = 100



Sources: Bloomberg; MSCI; RBA

Tails

- By definition tail data is very sparse
- For example how often do recessions occur?
 - No Australian recession for over 20 years
 - Changes in the composition of economy with a much higher weight in services rather than more volatile primary industries
- Other countries have had more frequent recessions
- What do we do with correlations in tail events?
- In GI. Frequency and location of earthquakes, hurricanes?
- Changes in exposure (more building in coastal areas and earthquake zones)

Management Actions

- Codified management actions
 - Dividends
 - Bonus rates
 - Investment de-risking
 - Capital transfers between statutory funds or between entities
- More difficult
 - Expense changes
 - Re-pricing

Un-modeled factors

- Strategic
- Regulatory and tax changes
- Competitor actions
- Reinsurer behavior
- Some management actions
 - Repricing
 - Expense reductions
 - Changes in sales volumes

Other inputs

- Stress testing
 - Gives the impact of a scenario based on plausible narrative
 - Easier for management and boards to understand
- Management overlays
 - These can allow for unmodeled risks
 - Reduce the probability of breaching ICAAP management triggers

Multi-year models

- Expanding funnel of doubt
- Management actions
 - Dividend policy
 - Bonus policies
 - Repricing
 - Sales volumes
 - Expenses
 - Capital structure – debt/equity/hybrids
- Stability of economic models (regime switching for market risk)
- Mean reversion becomes more important

Uses outside financial services

- BHP uses a stochastic economic capital model
 - Capital allocation
 - Strategic decisions
 - Dividend policy (95% confidence)
- Based its 'progressive dividend policy' on this.
- Recent events have been outside the 95% interval (simultaneous extreme falls in oil, iron ore, copper, coal and other resource prices.
- Had to significantly cut dividends.



Risks of Risk Based Capital

- Lack of diversity in ESGs
- A small range of ESG developers
- Similar calibrations
- Are we all concentrating on similar risk management techniques and responses?
- Herd behavior in stressed situations?
 - If everyone tries the same actions at the same time what happens?
- Mispricing of risk?
 - Are the models realistically pricing risk?
- Excessive reliance on diversification?
 - Correlations tend to increase in stressed times

Future developments

- Skewing distributions with judgmental overlays on short to medium term economic outlooks
- Multi year models
- More detailed modeling of management actions and ICAAP

Conclusions

- RBC is very powerful risk management tool. It has increased the understanding of risks that impact financial institutions and resulted in good discussions at Board and Senior Management levels.
- Its complexity and apparent precision can give the impression that it is more accurate than it really is.
- Needs to be used alongside other tools, such as stress testing
- Communication and understanding is a big challenge

RBC does have its own risks