



Objectives

- To introduce GAD
- To inform about what is happening and what GAD is doing on financial modelling and risk
- To understand some of Government's requirements and possible implications of risk
- To demonstrate the scope for actuaries to contribute

Government Actuary's Department

- Actuarial analysis – for the public sector – from the public sector
- Non ministerial department of the Chancellor
- 134 staff: 63 qualified actuaries, 40 trainees, 31 support
- 2011-12 turnover of £15m
- Teams providing analysis and advice on:
 - Public pensions policy
 - Private pensions policy
 - Public service pension schemes
 - Outsourcing and pensions
 - Investment & risk
 - Social security & demography
 - Insurance

“Where there is uncertainty, using mathematical and statistical methods, actuaries perform long-term financial modelling, analysis and certifications under a professional code and standards designed to give assurance on quality and consistency”

A selection of risk initiatives

- Departmental Governance – non-execs, strategic risk, Lord Browne LNEBMs
- Cabinet Office – Major Projects Authority
 - Requirement for Integrated Assurance Plans – do depts have required skills?
- National Audit Office – review of departmental risk management
- Coalition cuts – focus on big risks
- Government Actuary presentation to Perm Secs
- Follow-up meetings and strategic risk reviews
- HMT review of Green Book (risk in project appraisals)
- RAMP working party of Risk Improvement Group
 - Ensure full financial appraisals, not just base case (see below)

Issues with how boards identify and manage risk



Why worry about the headlights working when you're in this position?



Black Swan events – what are the chances of a destructive solar storm? Often higher than some events given much more attention



Why are there no tools or competencies for big or strategic risks?



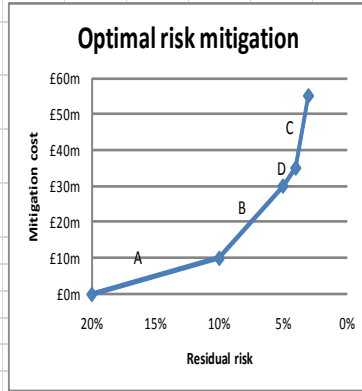
Who had the best Risk Registers before the recent financial crisis?

Risk review questions

- 1) How do you define key risks?
- 2) What are your key risks (including major project risks)?
- 3) How are they measured/quantified?
- 4) Who is in overall control?
- 5) Is there a separate risk committee?
- 6) What is the format of Board reporting?
- 7) What is the role of NEBMs?
- 8) What is your risk appetite?
- 9) How do you manage risks?
- 10) What's your capability on risk (a) assessment (b) management?
- 11) Do you link risk performance to appraisals? If so, how?
- 12) Do you link with other Government departments on cross-cutting risks?
- 13) How do you take decisions / choose between options?
- 14) What would be "failure" of the department? How does the Board measure success?

“Failure Risk” Example

Risk: Largest project is 30% over budget or less than 70% complete by target date, leading to accusations of "not fit for purpose"			
Assessed likelihood:	20%		
Possible mitigations:	Cost	Revised likelihood	Cost per % risk reduction
A Increase resources at scoping & planning stage	£10m	10%	£1.0m
B Provide additional training to staff involved	£20m	10%	£2.0m
C Increase IT support	£20m	15%	£4.0m
D Take out "business continuity" insurance to increase resilience of project	£5m	18%	£2.5m
Combinations:			
A,B	£30m	5%	£2.0m
A,B,C	£50m	4%	£3.1m
A,B,D	£35m	4%	£2.2m
A,B,C,D	£55m	3%	£3.2m



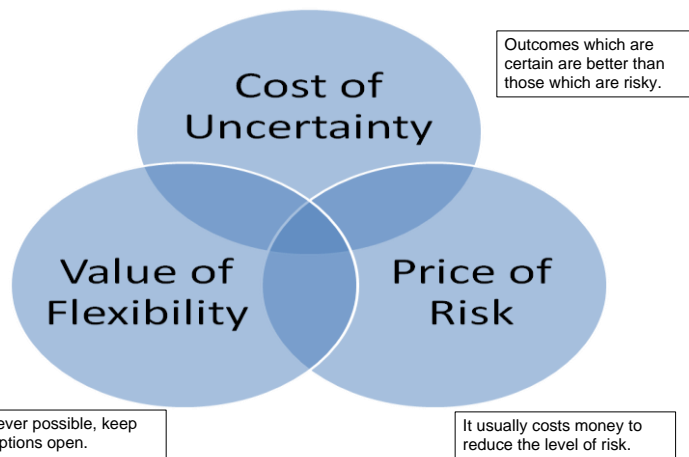
Some questions decision-makers may ask

- What are our key objectives?
- What are the constraints around our decisions or the project?
- What can we learn from previous experience of similar exercises?
- When do decisions need to be made?
- How do we identify risks?
- How can we quantify risks and the likely impact should they occur?
- What are the main risks that need to be monitored and how?
- How much should be spent on risk mitigation?
- How do we choose the best option?
- Should the project go ahead, or is there a better alternative?
- How might things change over time and how does this impact the risks and what should be done?
- Who is responsible for considering the overall position?

Some ways actuaries can help

- Run risk workshops for boards or executives
- Benchmark existing or develop new risk governance framework
- Explain or apply the RAMP project framework to identify, quantify and manage risks within projects
- Produce customised financial models illustrating benefits, financial impacts and risks of options
- Provide advice on model selection and development
- Review existing models and provide independent assurance
- Work with you to enhance systems to collect relevant and accurate data
- Review and analyse existing data to understand trends, uncertainties, etc.
- Evaluate alternative risk mitigation options
- Develop risk metrics and “dashboards”

Quantitative risk concepts or “How to make decisions”



Concepts (1): Cost of uncertainty

- The average value (cost), taking account of all possible outcomes, is likely to be lower (higher) than if all goes as planned
- Example:

Scenario	Details	Chance of occurring	Value of net benefits (£m)
A	Programme implemented on time as expected	60%	30
B	Adverse legal decision requires unwind after implementation	10%	-50
C	Delay due to computer problems	10%	20
D	Errors arise (poor staff training)	15%	16
E	Claimants manage to get more money than expected	5%	-70
Probability-weighted value:			14

Concepts (2): Price of risk

- There is a market for many risks
 - How much would an insurer charge to take on the risk?
 - What is the market price of risk-bearing securities trading in capital markets?
- HMT guidance is normally not to insure
 - Insurer profit margins
 - Limited capacity relative to Government
- Hence insurance not common in central Government
- But prices give valuable information about level of risk

Concepts (3): Value of flexibility

- Having the option to change course if things don't go as expected can be valuable
- So may be worthwhile keeping options open even if greater upfront cost
- Can quantify value using "real options theory"
- But of course flexibility for one party may be risk / uncertainty for another party

Summary of RAMP

- Risk Analysis and Management for Projects
 - Sponsored by actuarial & civil engineering professions since 1998
- Generic framework for appraising and managing project risks
- Concentrates on strategic and financial implications of risks
- Opportunities as well as threats, but pays special attention to disaster risks
- Methodology based on "whole life" concept - risk identification, analysis, responses, residual risks, decision processes, risk control
- Uncertainty, not just foreseeable risks
 - Seek out ambiguities in objectives and success criteria
 - Reduce vulnerability to lack of knowledge by systematic search for additional knowledge
 - Seek greater robustness/flexibility
- Demonstrates risks properly considered & reduces need to adjust for optimism bias

RAMP Example – Project Risks

Risk	Nature of risk	Likelihood	Impact	Mitigation	Cost	Revised likelihood	Revised impact	Change in cost of risk	Carry out?	Cost-effectiveness of risk reduction
A	Delay due to computer problems	10%	+\$100m	Employ extra IT resources	\$5m	8%	+\$100m	-\$2m	FALSE	40%
B	Errors arise due to poor staff training	15%	+\$140m	Train staff more thoroughly	\$10m	5%	+\$40m	-\$19m	TRUE	190%
C	Judicial review requires unwinding of change	10%	+\$800m	Keep records in form that facilitates unwind	\$0m	10%	+\$500m	-\$30m	TRUE	999%
D	Claimants receive more money than anticipated	5%	+\$1,000m	Change rules and employ extra staff	\$20m	4%	+\$600m	-\$26m	TRUE	130%
Cost of risk:		\$161m		Cost of mitigation:	\$30m	Revised cost of risk:	\$86m	Total new cost:	\$116m	

Mitigation combinations	Cost	Value obtained	Cost-effective ness
None	\$0m	+\$0m	
C	\$0m	+\$30m	999%
CB	\$10m	+\$49m	490%
CBD	\$30m	+\$75m	250%

Optimal risk mitigation

The chart illustrates the relationship between the cost of mitigation and the value obtained. The y-axis represents 'Value obtained' from \$0m to \$80m, and the x-axis represents 'Cost of mitigation' from \$0m to \$30m. A blue line connects four data points: C (0, 30), B (10, 49), D (20, 75), and an unlabeled point (30, 116). The points are labeled C, B, and D.

Point	Cost of mitigation	Value obtained
C	\$0m	\$30m
B	\$10m	\$49m
D	\$20m	\$75m
Unlabeled	\$30m	\$116m

Model assurance

- Peer review or external assurance that “fit for purpose”
- Assurance is an accepted part of government (e.g. Internal Audit, NAO) and fits well with professionalism of actuaries
- Technical standards produced by Board for Actuarial Standards (TAS M, TAS D and TAS R) are relevant and helpful
- Typical Terms of Reference to undertake a review of the modelling methodology, assumptions and use of data to:
 - Assess fitness for purpose
 - Provide comments on any limitations
 - Make suggestions on additional tests to better inform decision-making
- Growing demand for GAD’s services

Conclusion: Risk - why use an actuary?

- Used to handling uncertainty
- Full range of quantification techniques
- Inform decisions, not take them
- External, professional challenge and assurance

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Questions or comments?

Expressions of individual views by members of The Actuarial Profession and its staff are encouraged.

The views expressed in this presentation are those of the presenter.

