

# UNDERWRITERS ARE FROM MARS, ACTUARIES ARE FROM ...: FINDINGS FROM AN INTERNAL PREDICTION SURVEY ON EXPERT JUDGMENT

General Insurance Pricing Seminar

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Jo Lo, Head of Actuarial Research & Development

Nita Patel, Head of International Insurance Pricing

Aspen





## MAIN HYPOTHESIS

- Hypothesis we set out to test:
- Underwriters and analysts in a (re)insurance company make different judgments even when:
  - They have the same information
  - They are similarly incentivised
- To understand if holding specific roles matters
  - Anecdotally, underwriters have brighter personality...
  - ... analysts are gloomier!
  - And so make different judgments



## HEALTH WARNING

- This paper is a scientific contribution on how people make expert judgments
- Its contents should not be relied upon for other purposes. In particular:
  - They do not express views or opinions of the authors' employers
  - They are not about the authors' employers – and so should not be used to make inference about them



# SURVEY METHODOLOGY

## Quantitative Judgments – 2013 Prediction Challenge

*Please spend 15 minutes to give us your personal forecasts.*

Successful analytical work relies on the judgement of a variety of professionals. The actuarial community in Aspen have started a research project to understand how to work with expert judgments more effectively. Better understanding of how quantitative judgements are made by our different teams in Aspen would be a good starting point for this research.

To this end, one of our workstreams (Alan Calder, Shamara Gayle, Nita Patel (chair), Jo Lo, Peter Mills) has devised four simple prediction problems – please see the attached. We need your independent answers to each of them, together with how much confidence you have with your answers. You can additionally and optionally put in a range of likely outcomes. Any further comments would also be welcome, especially with regards to your thought process.

*At this stage, please do not collaborate with or consult others when coming up with your forecasts.* Studies on the impact of collaborative efforts will be a topic of future research.

The prediction problems are based on statistics drawn from insurance-related

- Four re/insurance related questions
  - Brief description – but anonymised
  - Presentation of data series – graph and table
- For each question, respondents asked to provide
  - 2013 Forecast
  - Optionally: comments
- All email based, questions set out on four tabs in an Excel workbook



## QUESTION 1 – AVIATION INCIDENTS

### Forecast Number of Major Loss Incidents for the 2013 AY

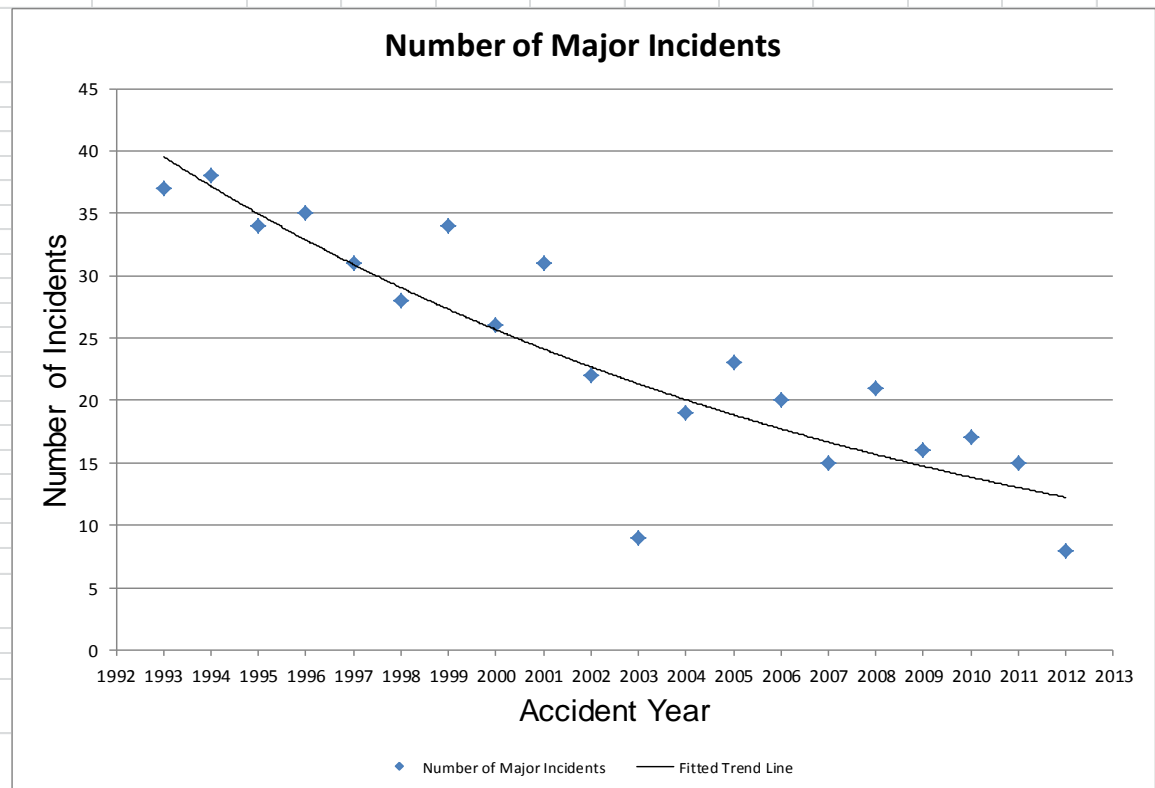
The table below shows the number of major loss incidents by Accident Year for a given industry. This industry has experienced significant improvements in safety standards and this is seen through the improving trend in the frequency of major loss incidents. Please select the most likely forecast for the 2013 Accident Year given the 20 year incident history. Please assume all major loss incidents are known.

Accident Year	Number of Major Incidents
1993	37
1994	38
1995	34
1996	35
1997	31
1998	28
1999	34
2000	26
2001	31
2002	22
2003	9
2004	19
2005	23
2006	20
2007	15
2008	21
2009	16
2010	17
2011	15
2012	8

2013 Most Likely Forecast	
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#### Forecast Range (Optional)

Lower Range	
Higher Range	





## QUESTION 2 – INDEPENDENT DATA SERIES

### Forecast Unknown Series

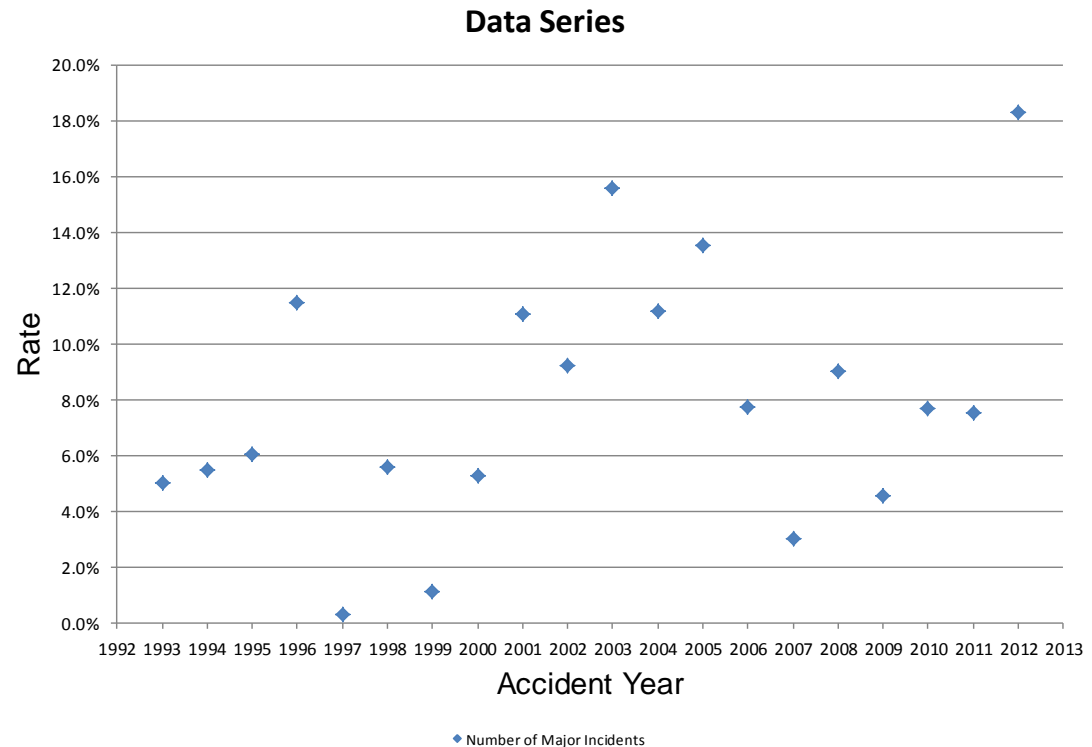
We are given a data series from an unknown source. The only thing we know is there will be a 2013 figure. What is the most likely forecast of the 2013 number?

Calendar Year	Data Series
1993	5.0%
1994	5.5%
1995	6.1%
1996	11.5%
1997	0.3%
1998	5.6%
1999	1.1%
2000	5.3%
2001	11.1%
2002	9.2%
2003	15.6%
2004	11.2%
2005	13.5%
2006	7.7%
2007	3.0%
2008	9.0%
2009	4.5%
2010	7.7%
2011	7.5%
2012	18.3%

2013 Most Likely  
Forecast

#### Forecast Range (Optional)

Lower Range	
Higher Range	



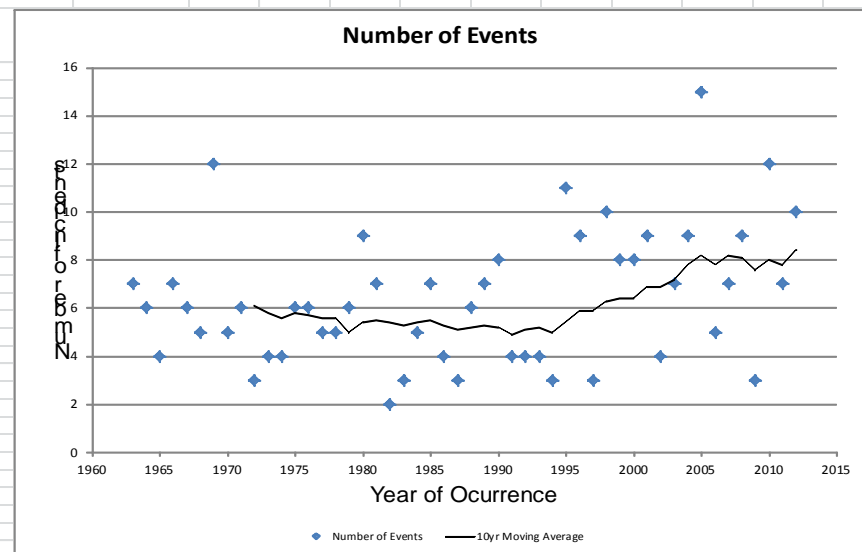


## QUESTION 3 – NORTH ATLANTIC HURRICANES (CAT 1)

### Forecast the Number of occurrences of a natural peril

A major natural hazard has a regular seasonal occurrence but the total number of events in a given season varies significantly year to year. There is a body of scientific evidence that suggests the numbers of events are also influenced by longer term climatic cycles. Please select the most likely forecast for 2013 year of occurrence, given the 50 year record of observed events. Please assume all major incidents are known and defined by a simple category scale.

Year of Occurrence	Total Number of Events
1963	7
1964	6
1965	4
1966	7
1967	6
1968	5
1969	12
1970	5
1971	6
1972	3
1973	4
1974	4
1975	6
1976	6
1977	5
1978	5
1979	6
1980	9
1981	7
1982	2
1983	3
1984	5
1985	7
1986	4
1987	3
1988	6
1989	7
1990	8
1991	4
1992	4
1993	4
1994	3
1995	11
1996	9
1997	3
1998	10
1999	8
2000	8
2001	9
2002	4
2003	7
2004	9
2005	15
2006	5
2007	7
2008	9
2009	3
2010	12
2011	7
2012	10



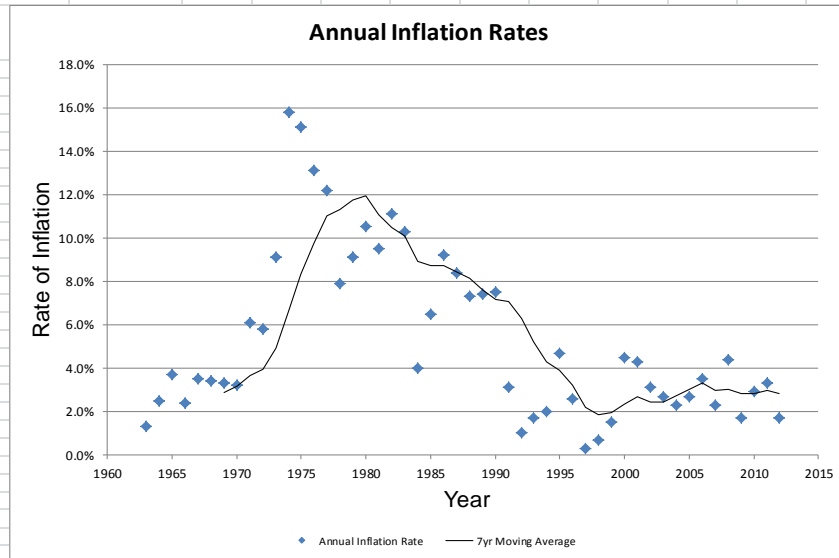


## QUESTION 4 – AUSTRALIAN INFLATION RATES

### Forecast the 2013 Inflation rate for country A

The table below shows the annual inflation rates for country A which is an OECD member. Please select the most likely forecast for the 2013 rate of inflation given the 50 year history.

Year	Annual Inflation Rates
1963	1.3%
1964	2.5%
1965	3.7%
1966	2.4%
1967	3.5%
1968	3.4%
1969	3.3%
1970	3.2%
1971	6.1%
1972	5.8%
1973	9.1%
1974	15.8%
1975	15.1%
1976	13.1%
1977	12.2%
1978	7.9%
1979	9.1%
1980	10.5%
1981	9.5%
1982	11.1%
1983	10.3%
1984	4.0%
1985	6.5%
1986	9.2%
1987	8.4%
1988	7.3%
1989	7.4%
1990	7.5%
1991	3.1%
1992	1.0%
1993	1.7%
1994	2.0%
1995	4.7%
1996	2.6%
1997	0.3%
1998	0.7%
1999	1.5%
2000	4.5%
2001	4.3%
2002	3.1%
2003	2.7%
2004	2.3%
2005	2.7%
2006	3.5%
2007	2.3%
2008	4.4%
2009	1.7%
2010	2.9%
2011	3.3%
2012	1.7%







## RESPONSE RATES

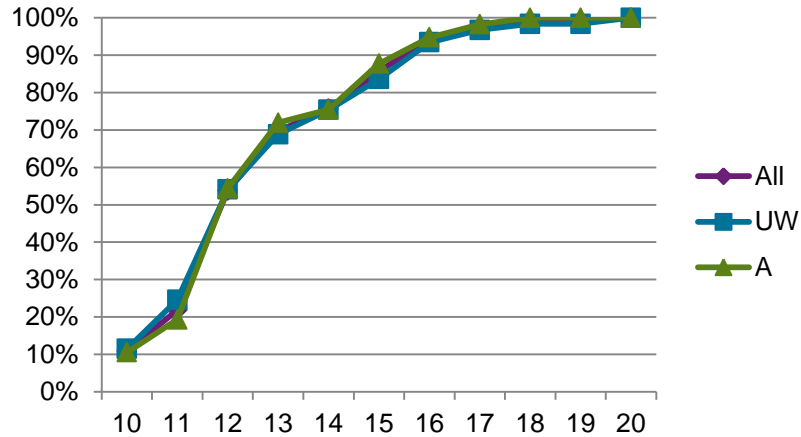
- Total 121 respondents
- Even splits between:
  - UW / non UW
  - UK / non UK
  - Heads / non Heads
- Around 40% gave comments

Forecast	Q1	Q2	Q3	Q4
Count	Aviation	Independent	Cats	Inflation
Total #	119	118	120	118
UW	61	59	61	60
A	57	58	58	57
UK	64	62	64	62
Non UK	55	56	56	56
Heads	63	60	63	61
Non Heads	56	58	57	57
Comments	53	56	50	46
	45%	47%	42%	39%

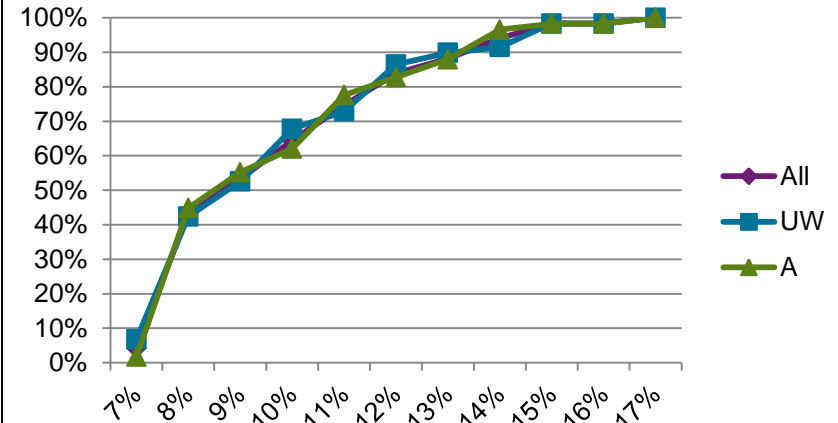


## ROLES – VERY LITTLE DIFFERENCE FOR ALL FOUR QUESTIONS

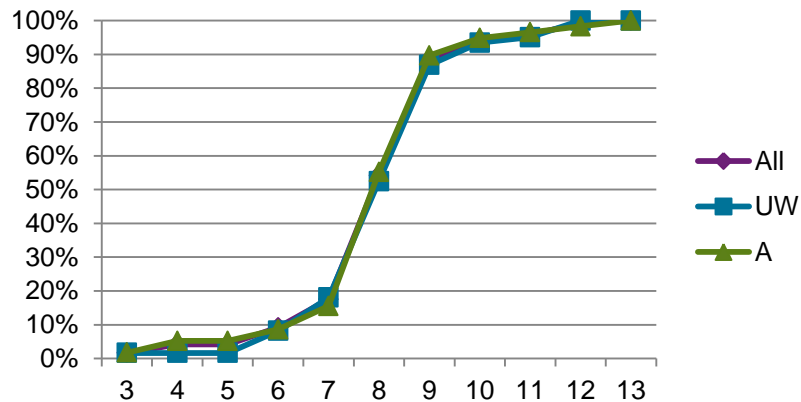
### Q1 - CDF of Forecasts



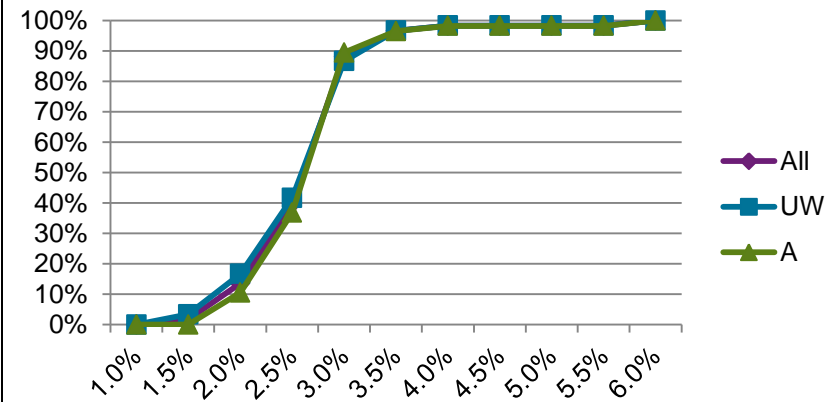
### Q2 - CDF of Forecasts



### Q3 - CDF of Forecasts



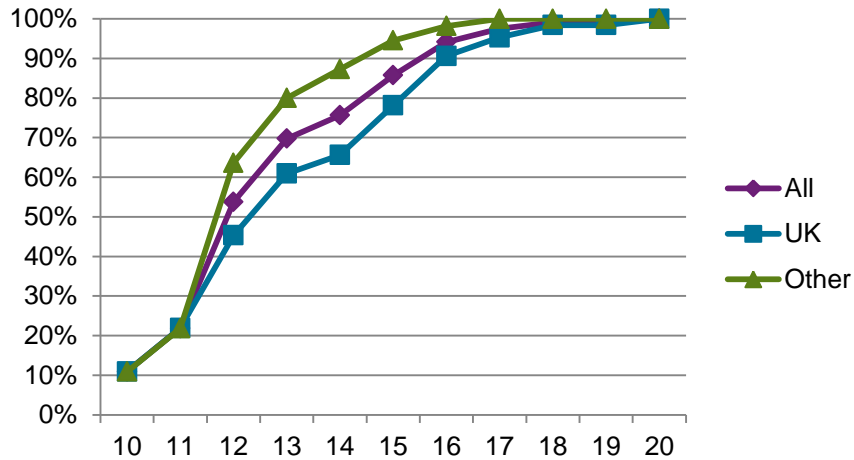
### Q4 - CDF of Forecasts



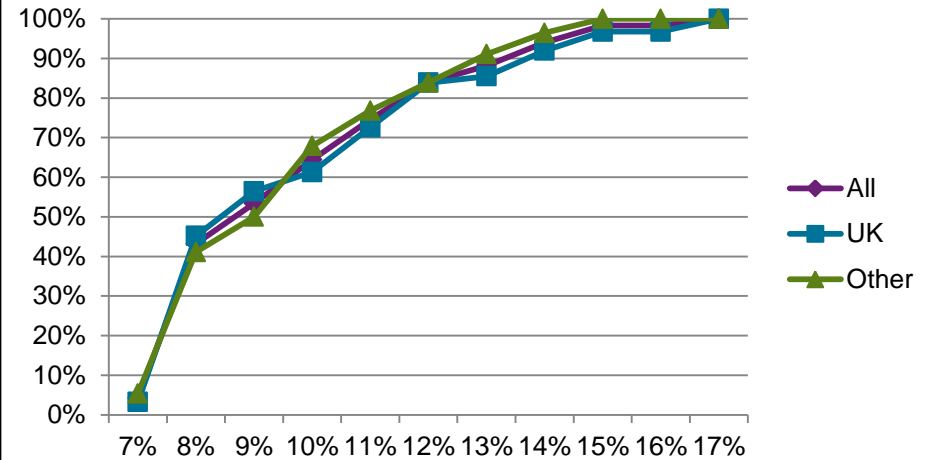


## LOCATIONS – DIFFERENCES FOR FUTURE RESEARCH

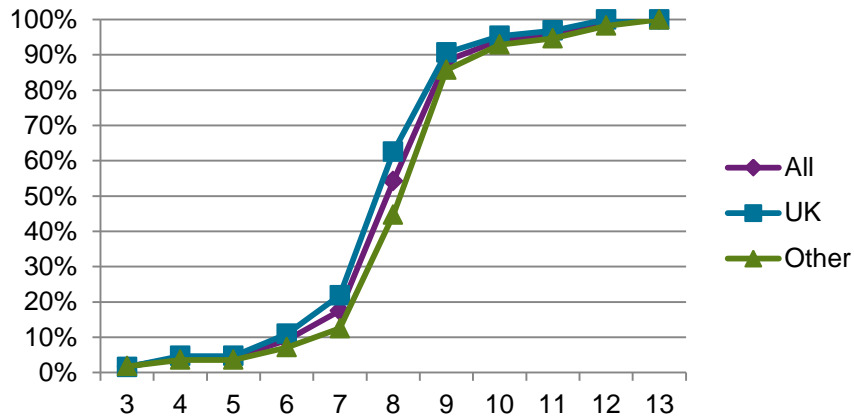
### Q1 - CDF of Forecasts



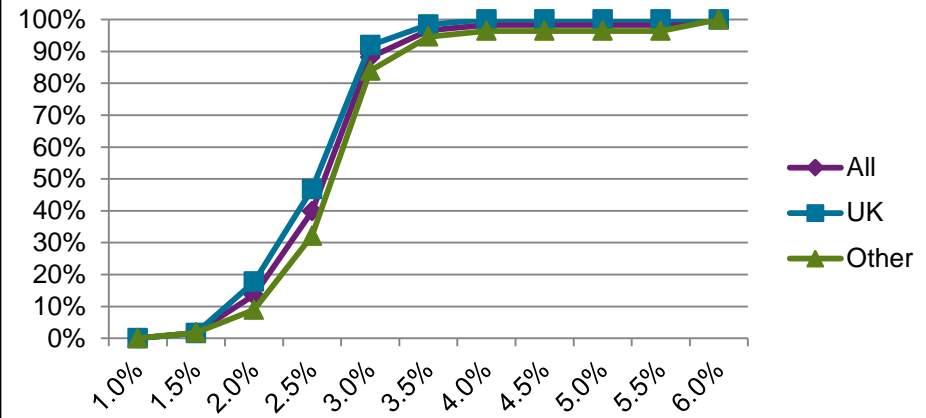
### Q2 - CDF of Forecasts



### Q3 - CDF of Forecasts



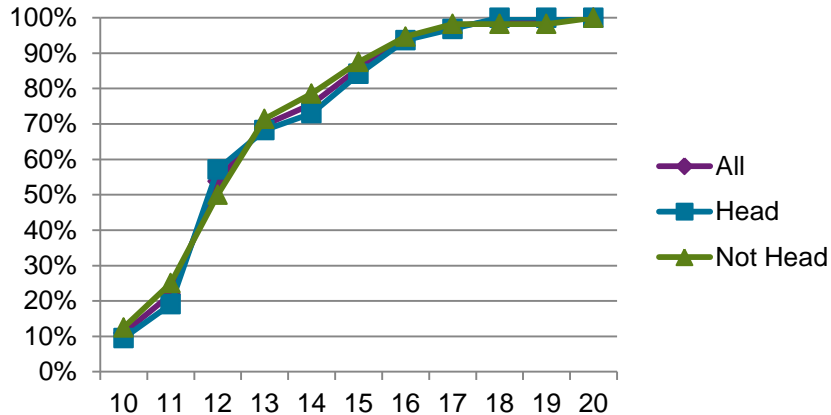
### Q4 - CDF of Forecasts



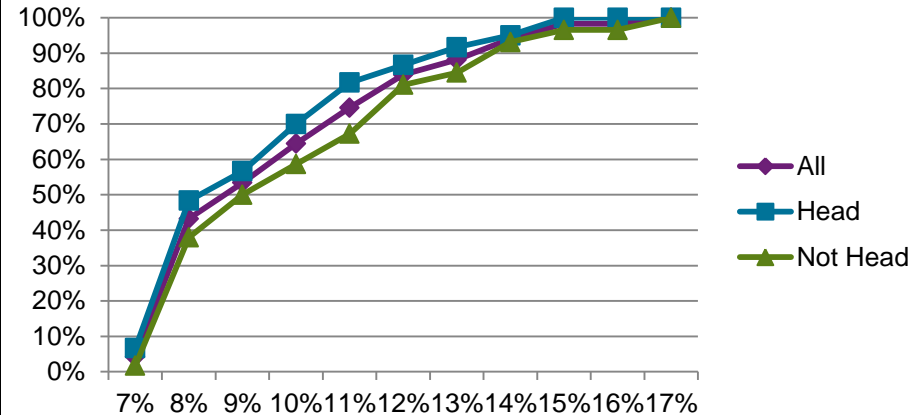


## EXPERIENCE – MIXED PICTURE

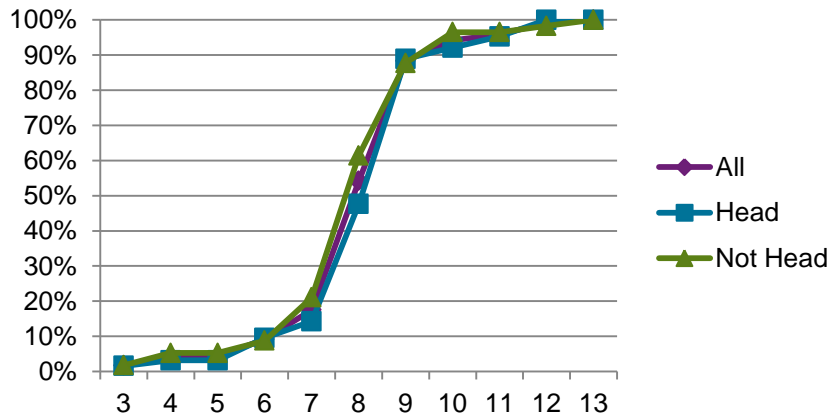
### Q1 - CDF of Forecasts



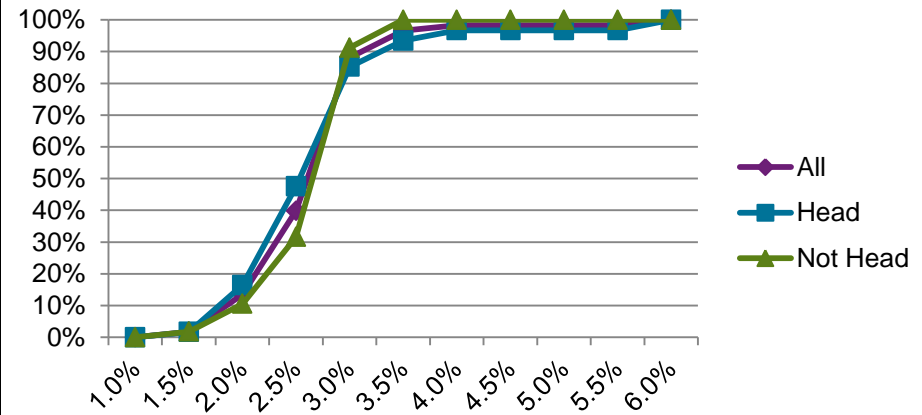
### Q2 - CDF of Forecasts



### Q3 - CDF of Forecasts



### Q4 - CDF of Forecasts





## RESPONSE RATES (PRICING SEMINAR)

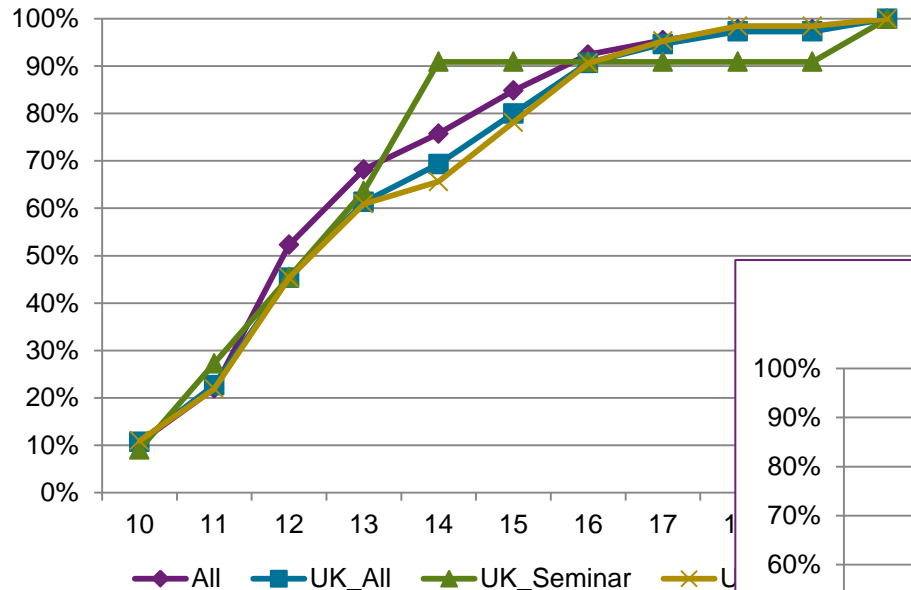
- Total 13 respondents
- Largely UK actuaries
  - Pricing disciplines
  - Mix of markets
  - Average 6.6 years of experience
- None have seen questions before

Forecast	Q1	Q2
Count	Aviation	Independent
Total_Seminar		13
A_Seminar		13
A_Orig		57
A_All		70
UK_Seminar		11
UK_Orig		64
UK_All		75

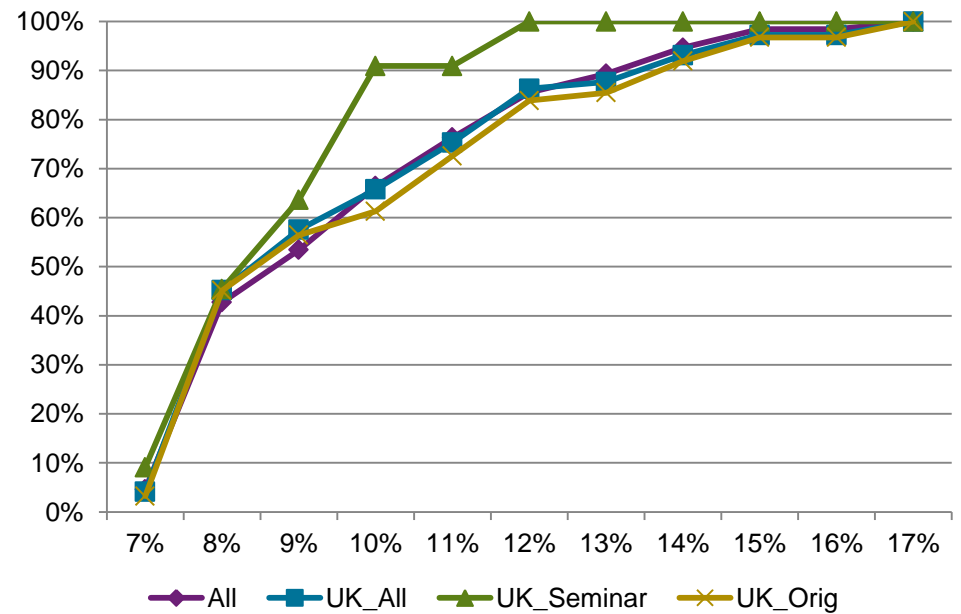


# GENERALISABILITY

## Q1 - CDF of Forecasts



## Q2 - CDF of Forecasts

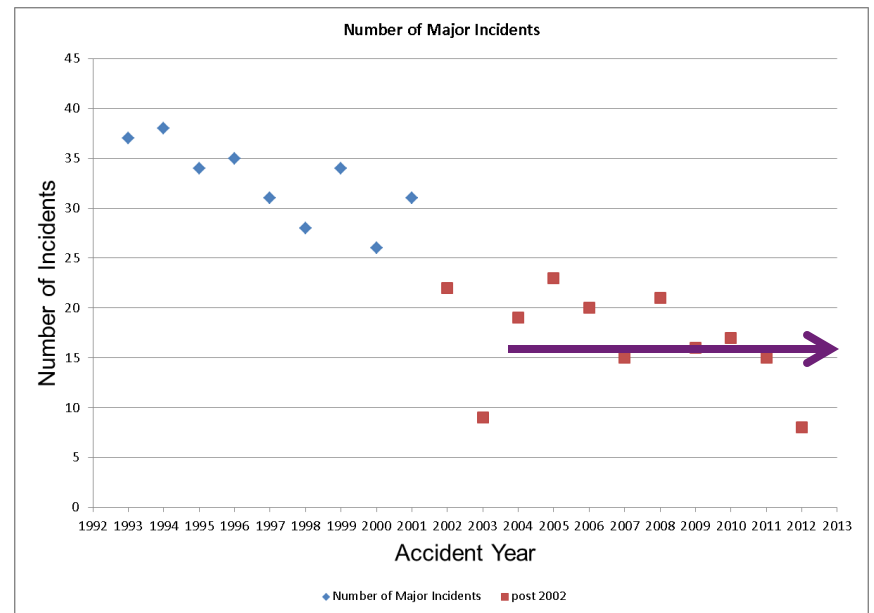
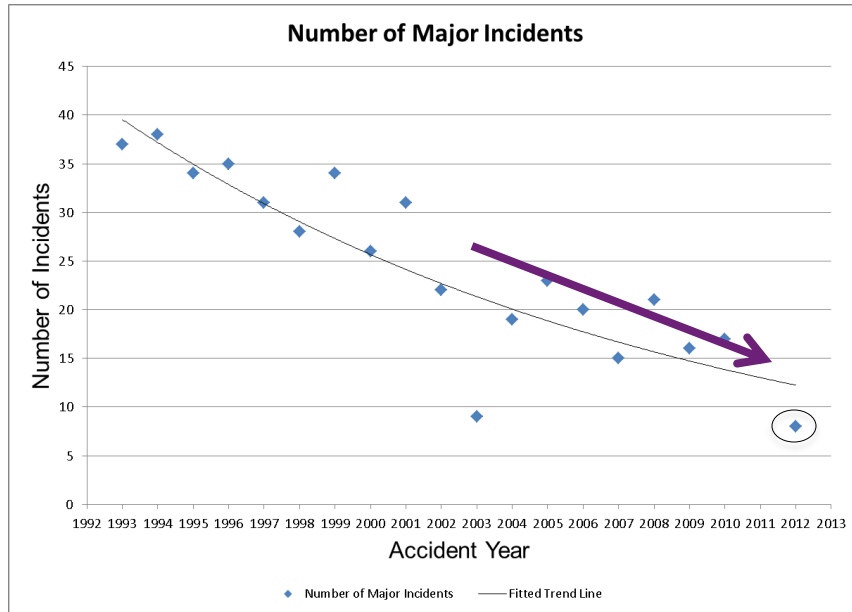




- | Forecast | Confidence | Comments   |
|----------|------------|--|
|          |            | Trend line looks like it is being pulled down by the outlier for 2003. I think it should be slightly higher to go through the middle of most of the data. Therefore predicted 13 which is slightly higher than the trendline at 2013.  |
| 13       | 4          | Confidence: in 20 years of data we have had one significant outlier, and all other data points lie within about 5 incidents of the trend line (adjusted slightly upwards). Therefore I'd say that +/- 5 gives us roughly a 95% confidence interval, so I've gone with 13-5 = 8 for the lower and 13+5 = 18 for the upper.  |
| 17       | 4          | It is unclear whether the definition of "major loss" is based on the size of the loss and if so, whether that has been trended; Assuming the key improvements in safety standards occurred around 2002/2003 and then again in 2011/2012 but after one year of closely following regulations, companies got complacent.<br>Predicting the same to happen as in 2004 to 2011 (complacency) but not to the same extent. |
| 14       | 3          | If you assume that 8 could potentially be an outlier since it is a much greater decrease, then in 2013, you will have a greater number of major incidents, but still decreasing due to the curve and the improvements in safety standards. Since there is some justification behind why the numbers are dropping, my confidence in this forecast is normal.  |
| 13       | 4          | There are 2 years with particularly low figure which does not fit the rest of the points in my opinion and therefore I have excluded them when forecasting.  |
| 11.75    | 3          | Approx 1 SD from Mean  |



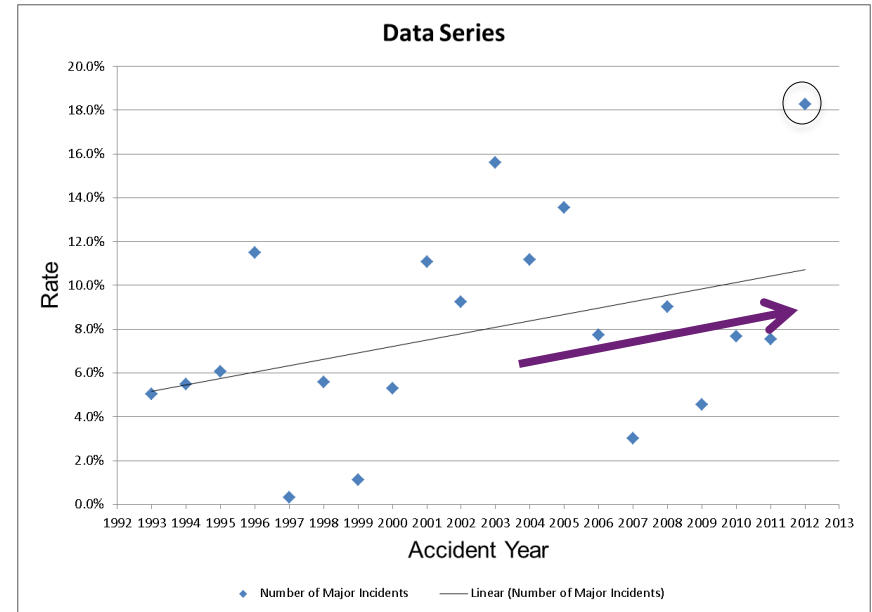
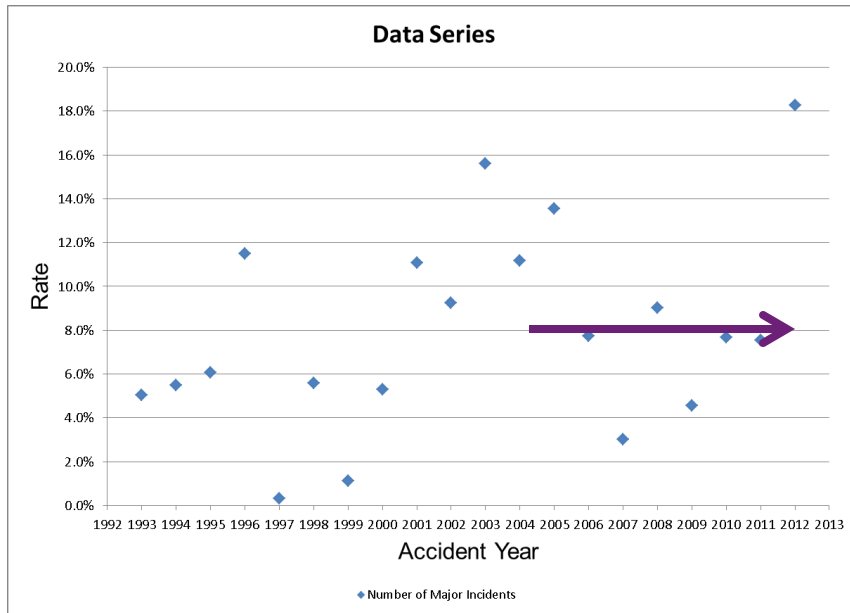
# CONTINUOUS TRENDS OR DISCRETE REGIMES?





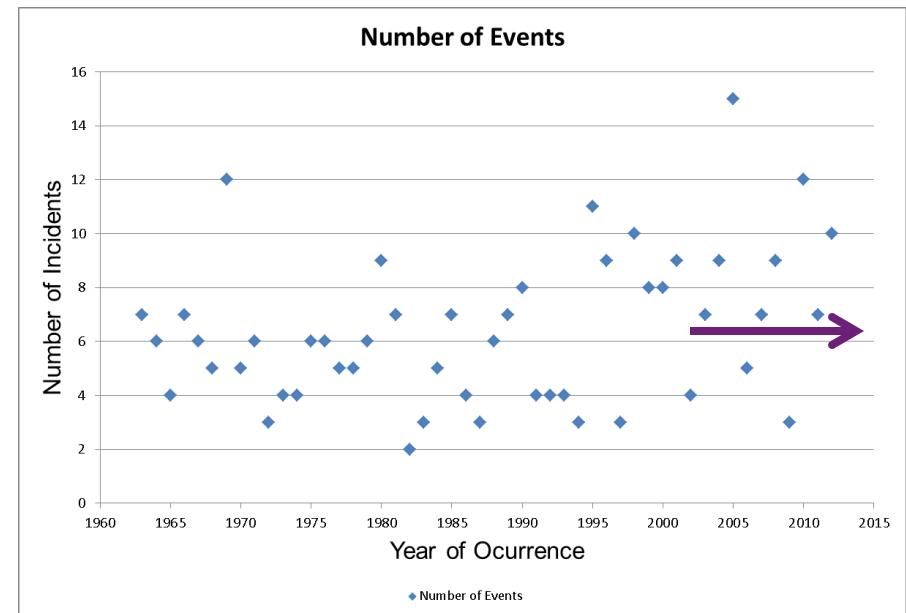
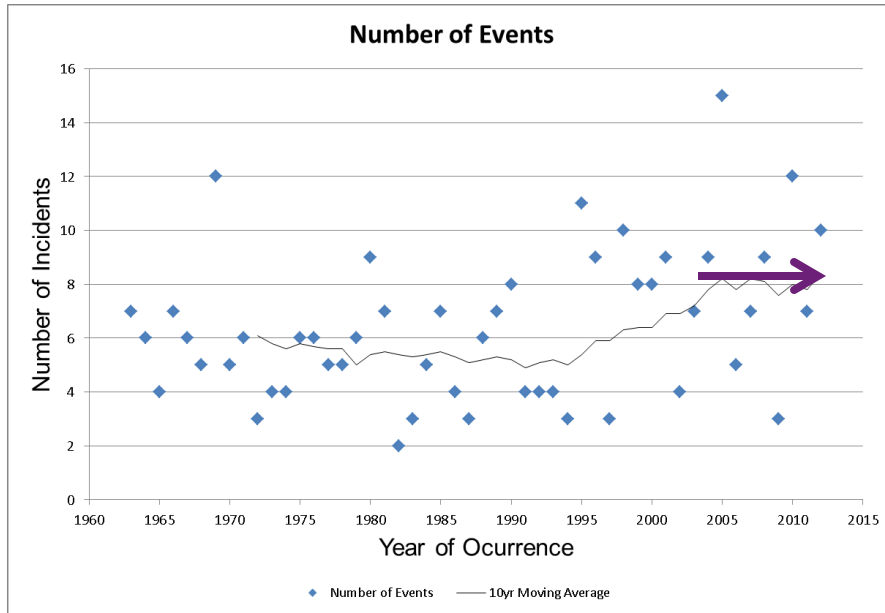


# IS THERE A TREND?





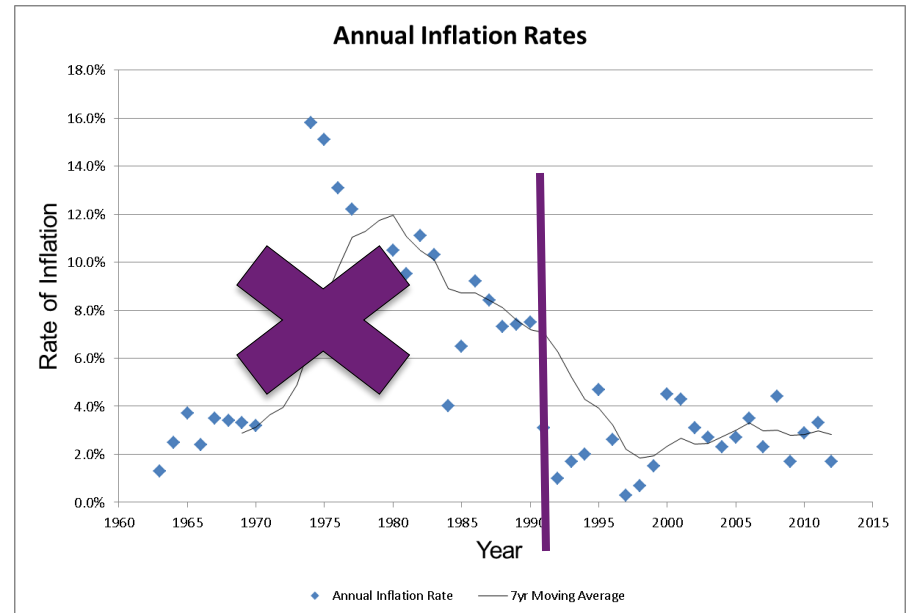
# IS THERE A SIGNIFICANT SHIFT?





## SHOULD WE USE BROKEN-LEG CUES?

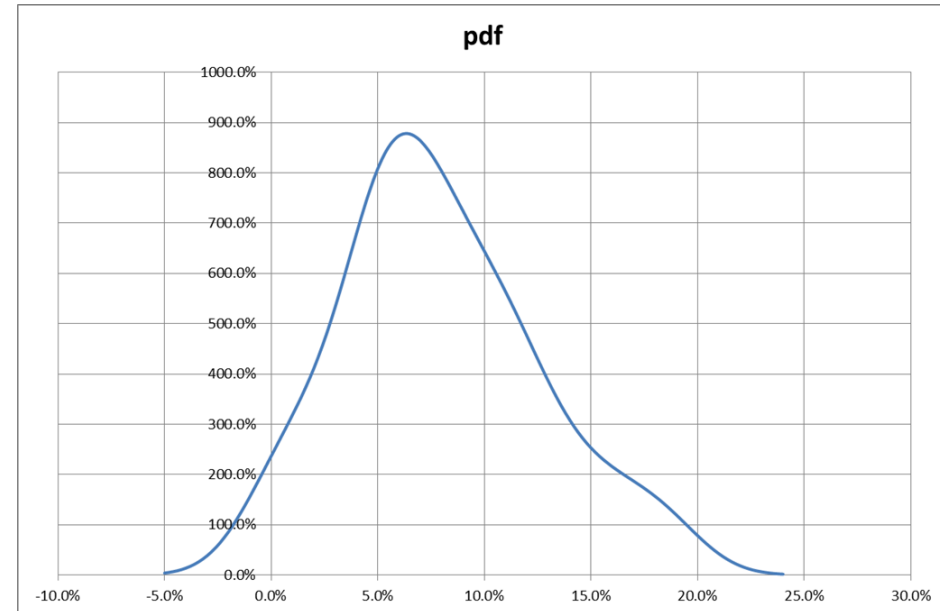
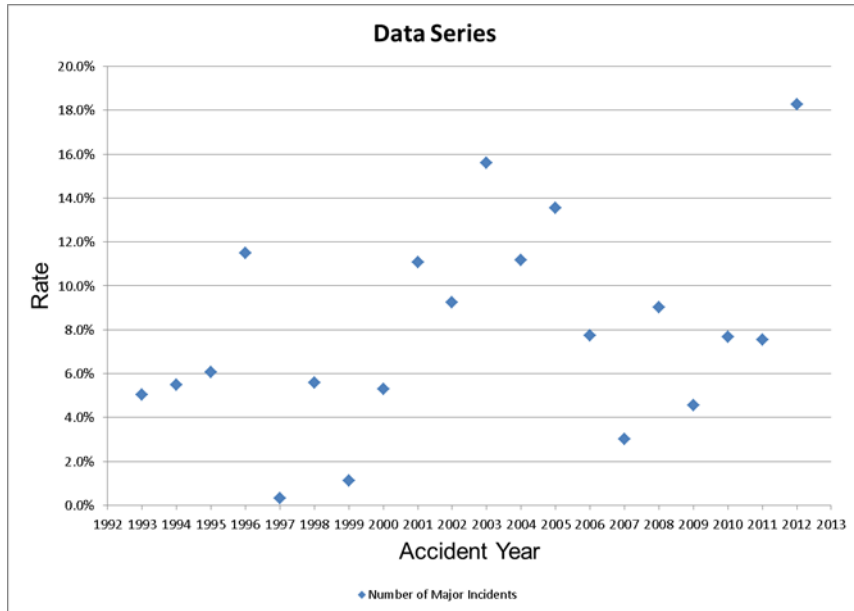
- Inflation is a subject our respondents have much to say
  - Q.E., political institutions of OECD countries, wage negotiations, etc.
- Most used data from before 1990
- More ready to use current environmental knowledge to supplement data projections





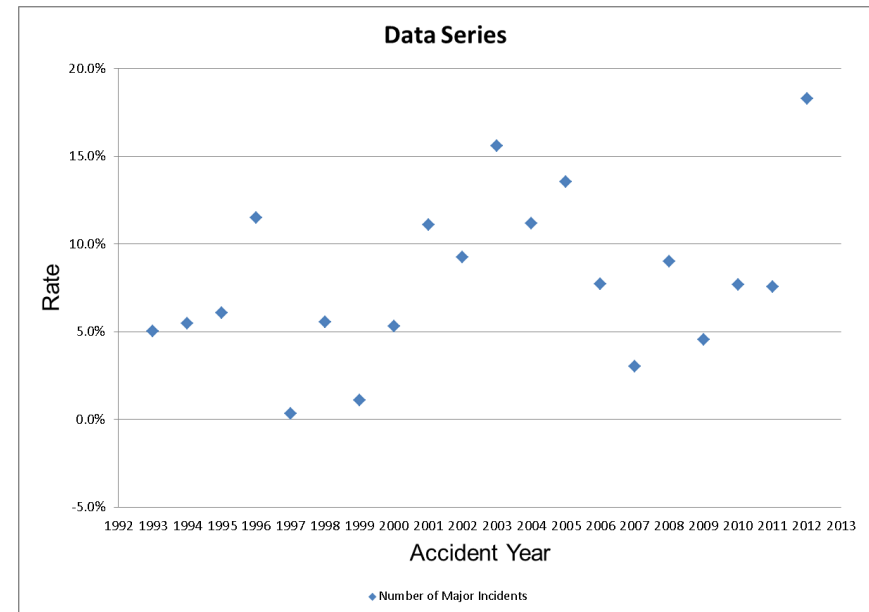
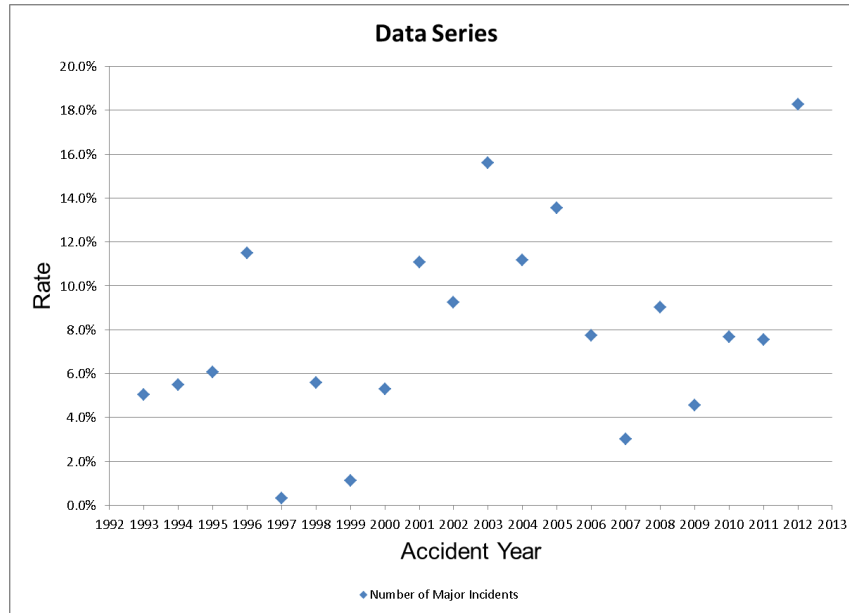
## HEADWIND: LOOSE USAGE OF TECHNICAL TERMS

- Do we have a *random* series or an *independent* one?





## HEADWIND: AXES CAN BE MISLEADING





## TAILWIND: EXPLICIT STATEMENTS OF RATIONALE

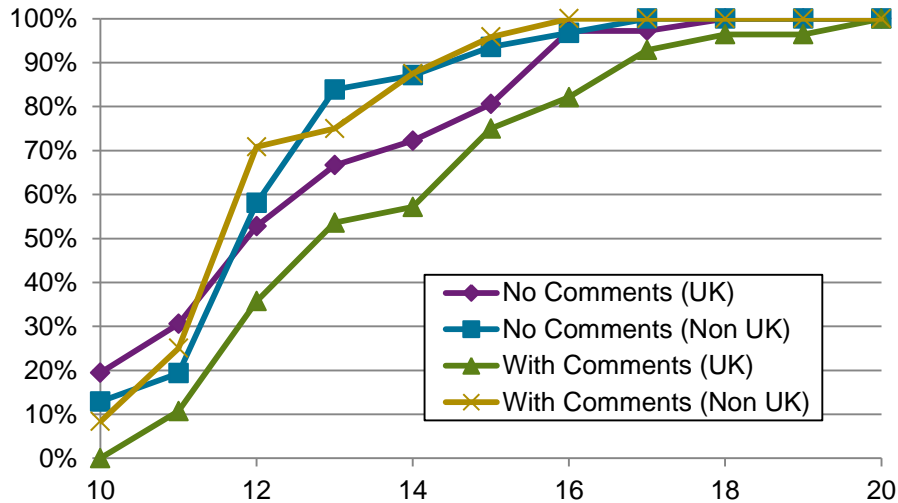
In theory, provision of rationale gives opportunity to think more

Some evidence to support this

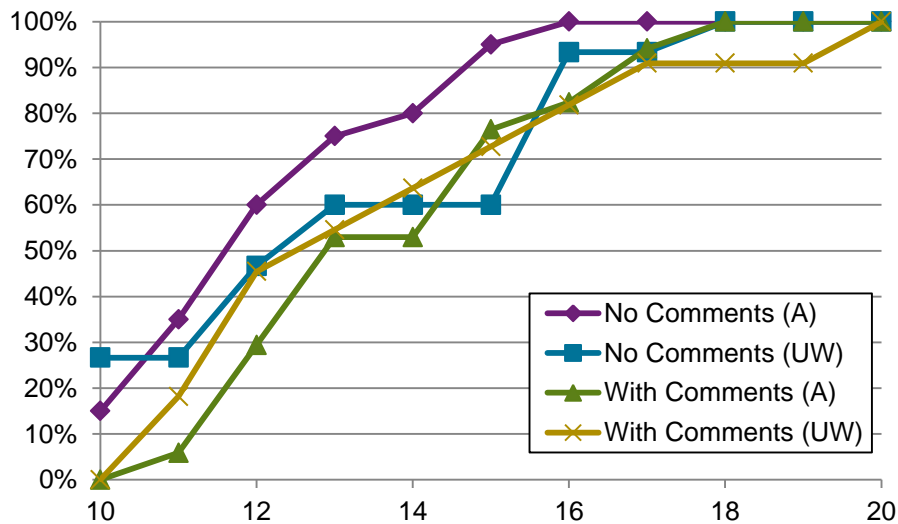
But some time we do not see such a large difference

There are other reasons to document!

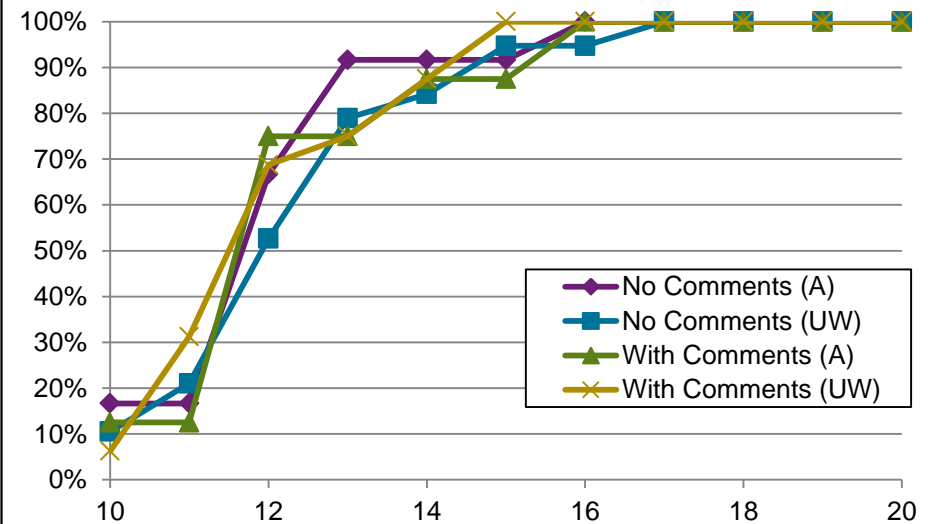
Q1 - CDF of Forecasts



Q1 - CDF of Forecasts for the (UK) group

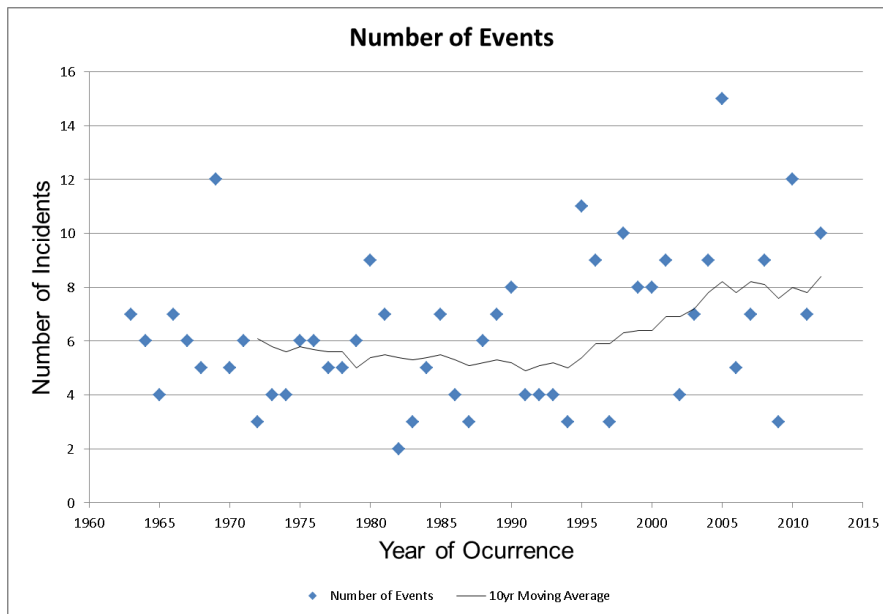


Q1 - CDF of Forecasts for the (NonUK) group





## TAILWIND: MOVING AVERAGE LINES ARE USEFUL FOR ESTIMATING

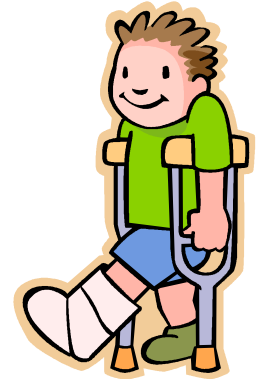


- Many people found the moving average line useful
- Helps to identify signals from noise



## PRACTICAL RECOMMENDATIONS

- Encourage different interpretations
  - Continuous trend vs regime shift vs independence vs noise
  - Broken-leg cues
- Assess impact of key outliers
  - Especially if they are in the most recent year
- Be mindful about presentation of data
  - Flattening data;
  - Axes ...

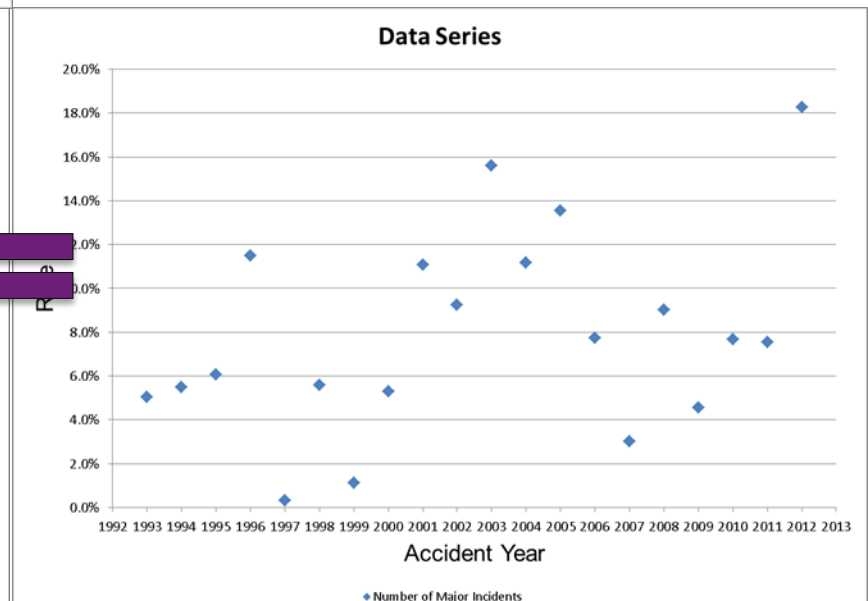
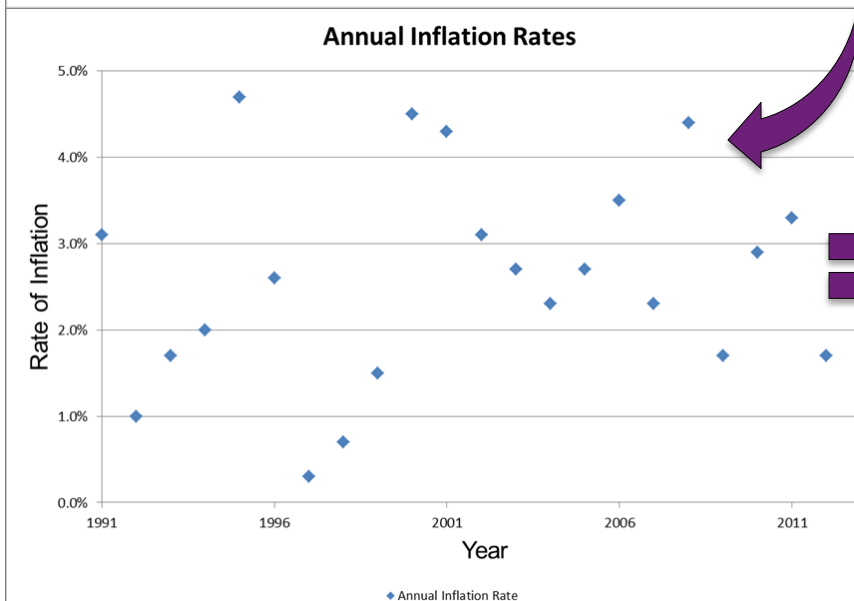
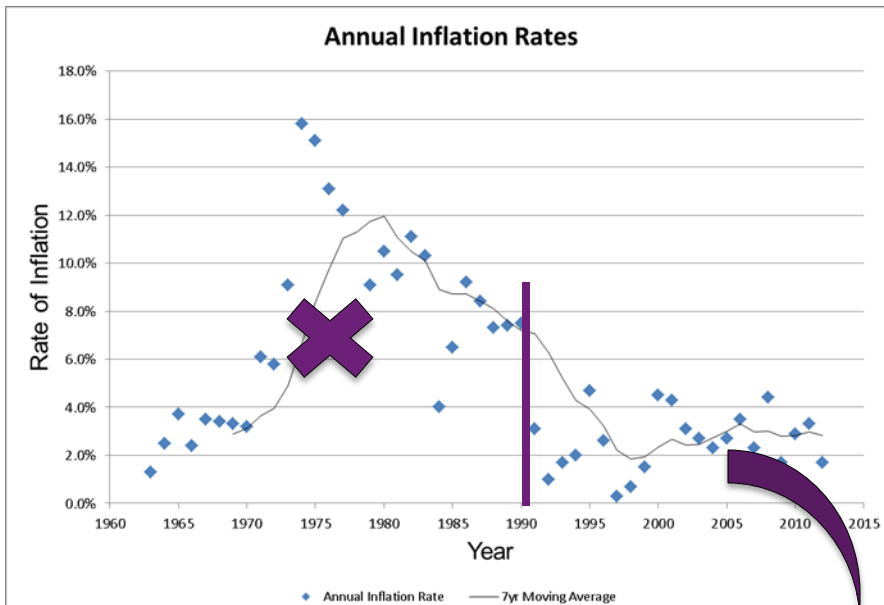






## PRESENTATION OF DATA – AXES COULD AFFECT CONFIDENCE?

- High confidence was attached to Q4 forecasts
- Let's focus on post 1990?
- Then we go back to Q2, where there was very low confidence





## NEXT STEPS

- You can do similar exercises, too
  - Useful as exercise in itself to raise awareness
  - More findings springboard into more hypotheses and research
- Or perform other behavioural tests
  - Incentives (e.g. asymmetric ones)
  - Revisits (e.g. renewals, revision of reserves)
  - Complex projections (e.g. triangles)
- Also: devise and test ways to counter cognitive biases
  - What kind of training?
  - What kind of peer review policies?



## KEY POINTS OF THE PAPER

- Results do not give enough evidence to support the hypothesis that, when presented with the same information and personal incentives, professional roles are associated with different judgments
- Differences in judgments come more from individual interpretations of data, which in turn are based on factors such as data presentations
- Recommendations for presentations and discussions of data



I THANK YOU