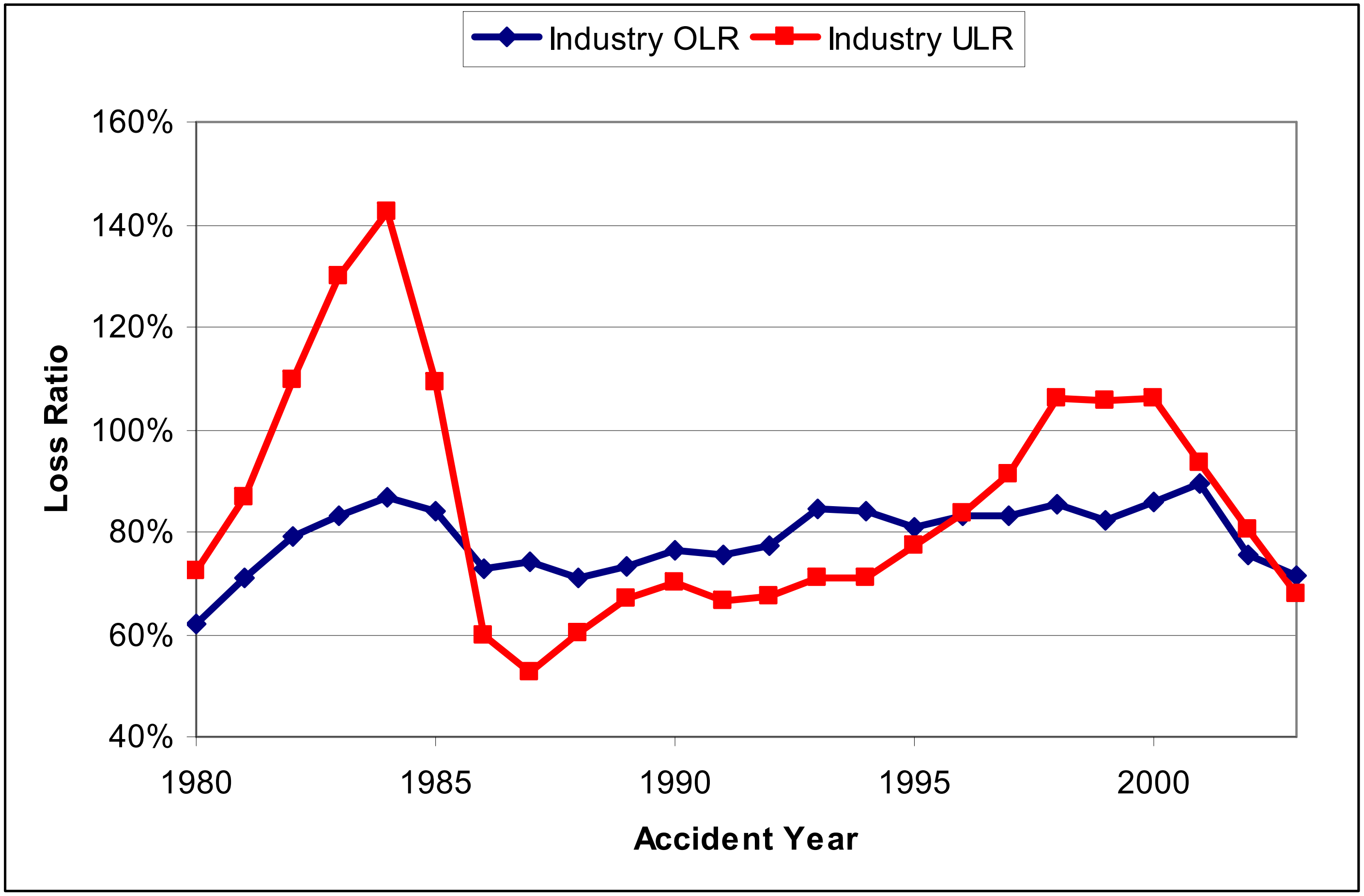
LOSS RATIO UNCERTAINTY AND THE MARKET CYCLE

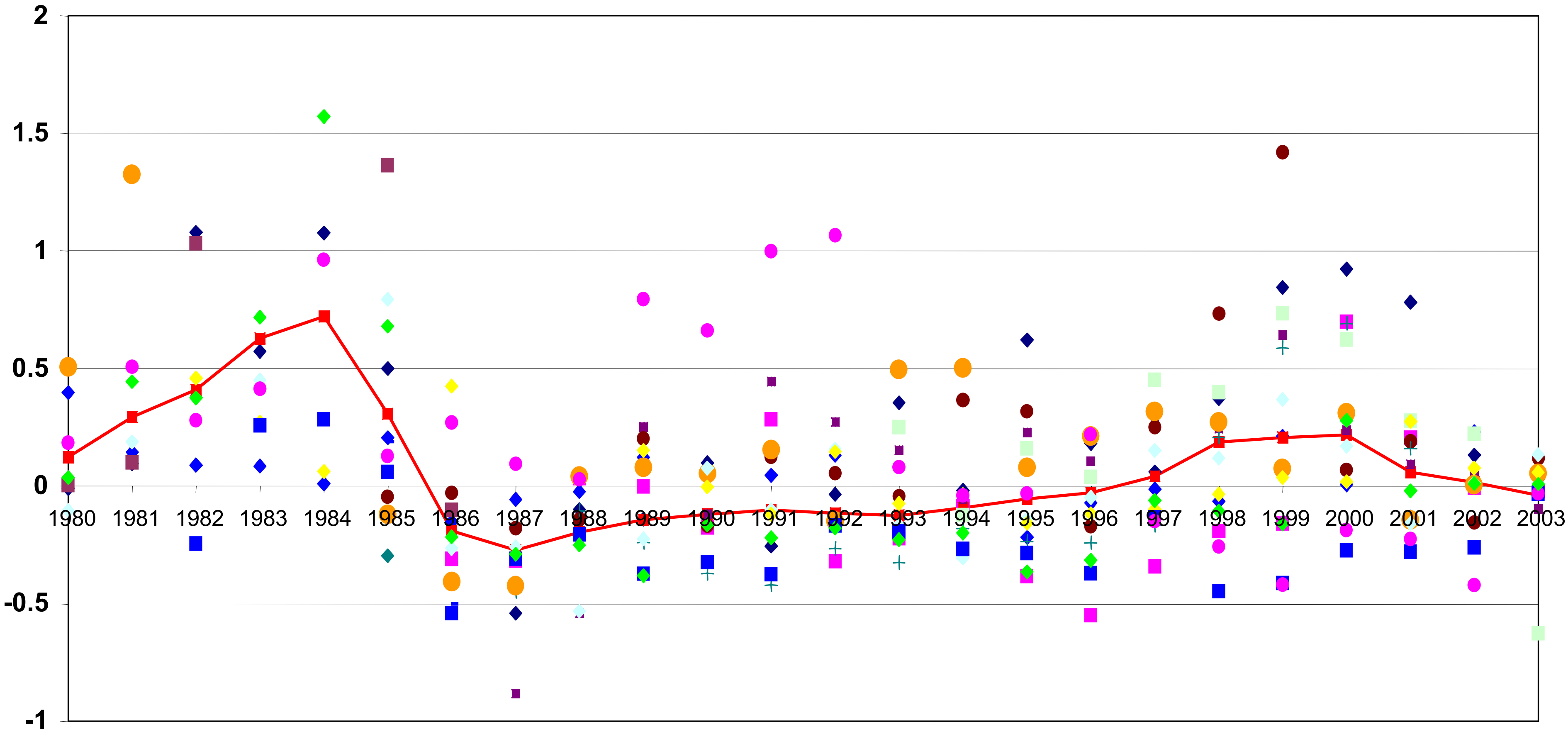
LOSS RATIO UNCERTAINTY

- Usually companies do a good job of estimating LRs
- But sometimes the industry as a whole is very wrong
- For long-tail casualty lines:
  - LR estimation error correlated to the market cycle
  - Persists over a number of years

OTHER LIABILITY OCCURRENCE
LR @ 12 MOS VS. ULTIMATE



OTHER LIABILITY OCCURRENCE
% CHANGE FROM OLR TO ULR



REINSURANCE IMPLICATIONS

- LR estimation error should be considered when
  - Forming reinsurance strategy
    - Adverse Development Cover: past years
    - Quota Share or Stop Loss: unforeseen frequency
    - XOL: frequency of severity
  - Negotiating terms and pricing
    - Reinsurers’ view of estimation error may differ from cedents’
- OK, but how to quantify it?

TOP-DOWN APPROACH

Define estimation error ratio R = ULR / OLR

For a single company: average over a long time frame yields “company bias”

- Might differ from 1.0 depending on reserve strategy

For a single accident year: average over a large number of companies yields “industry delusion” for that accident year

- Difference between industry’s initial view of loss potential for that AY and true loss potential

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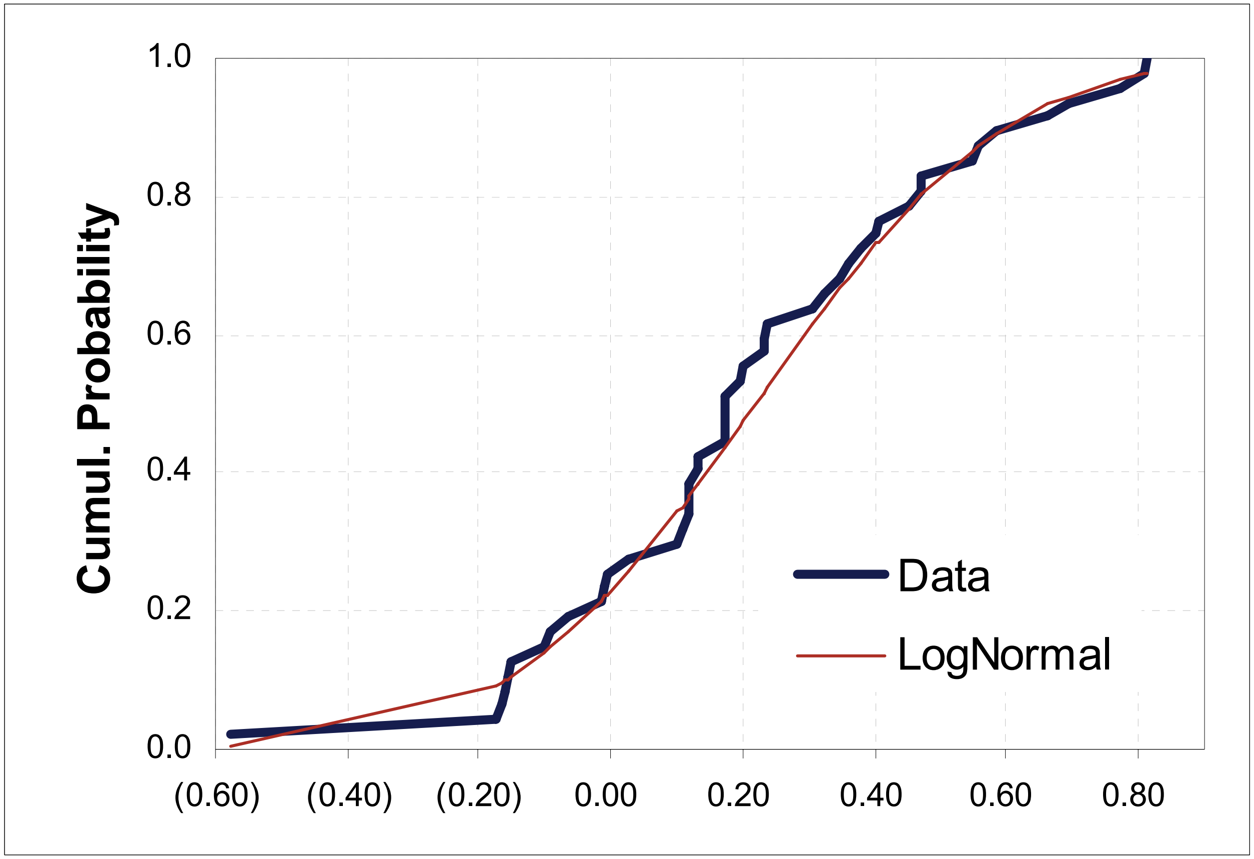
TOP-DOWN APPROACH

Key findings: Other Liability Occurrence

- For each accident year the R values are lognormally distributed across companies
- The mean and standard deviation of these lognormal distributions are linked
- The lognormal σ parameter can be approximated as a function of the μ parameter
- The μ parameter can be analyzed using time series methods

LOGNORMAL FIT



Sample lognormal fit to $R(c, t_i)$ by method of moments (AY 1999)

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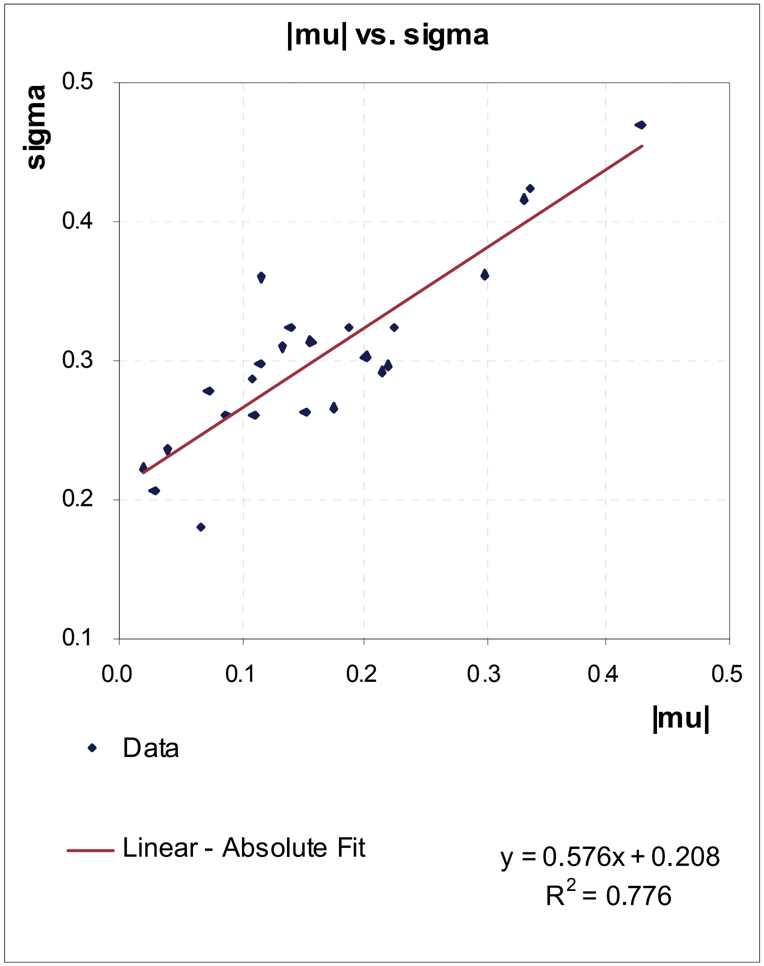
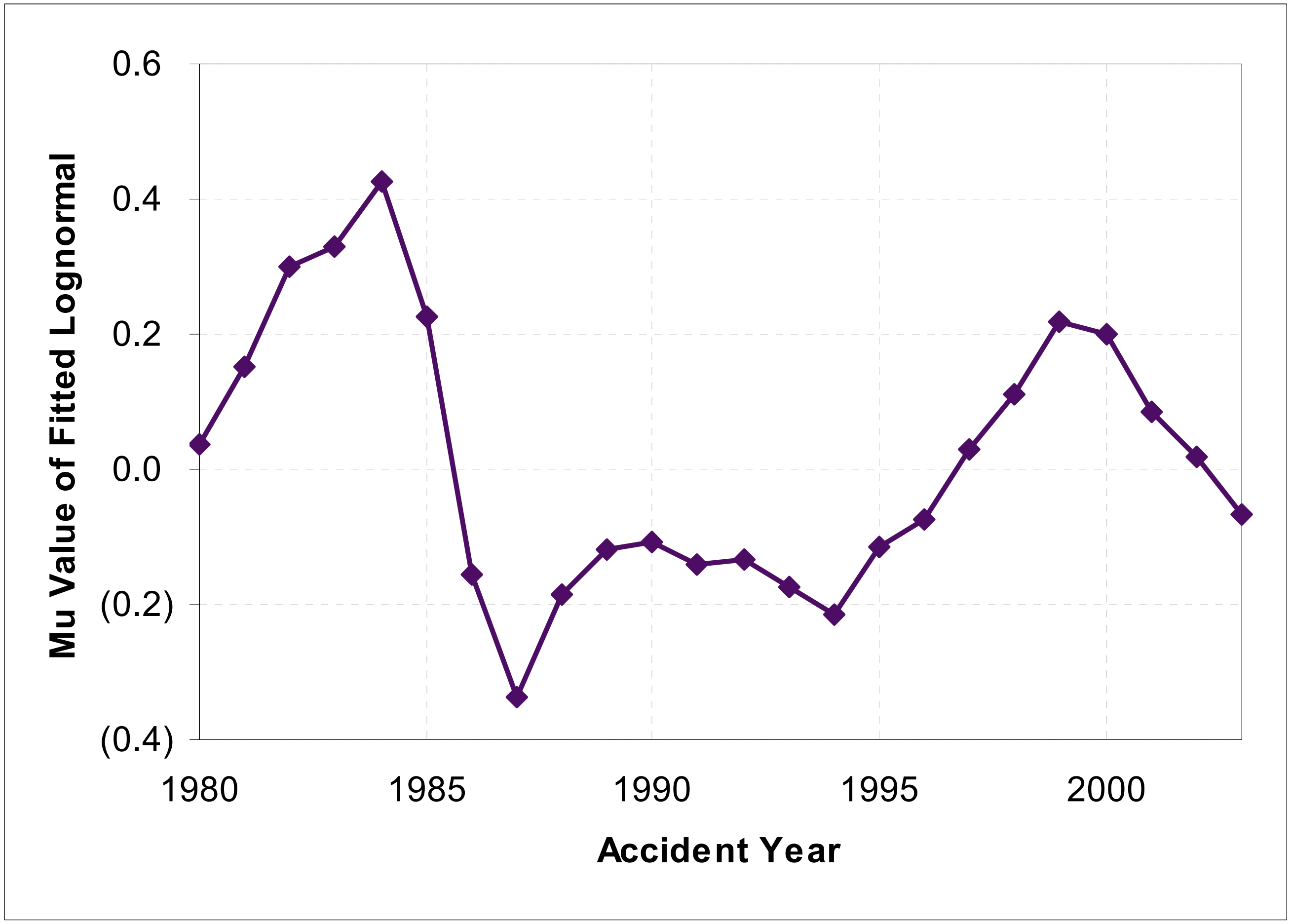
LINKAGE OF LOGNORMAL PARAMETERS



The σ parameter can be approximated as a function of the μ parameter

BEHAVIOR OF μ PARAMETER OVER TIME



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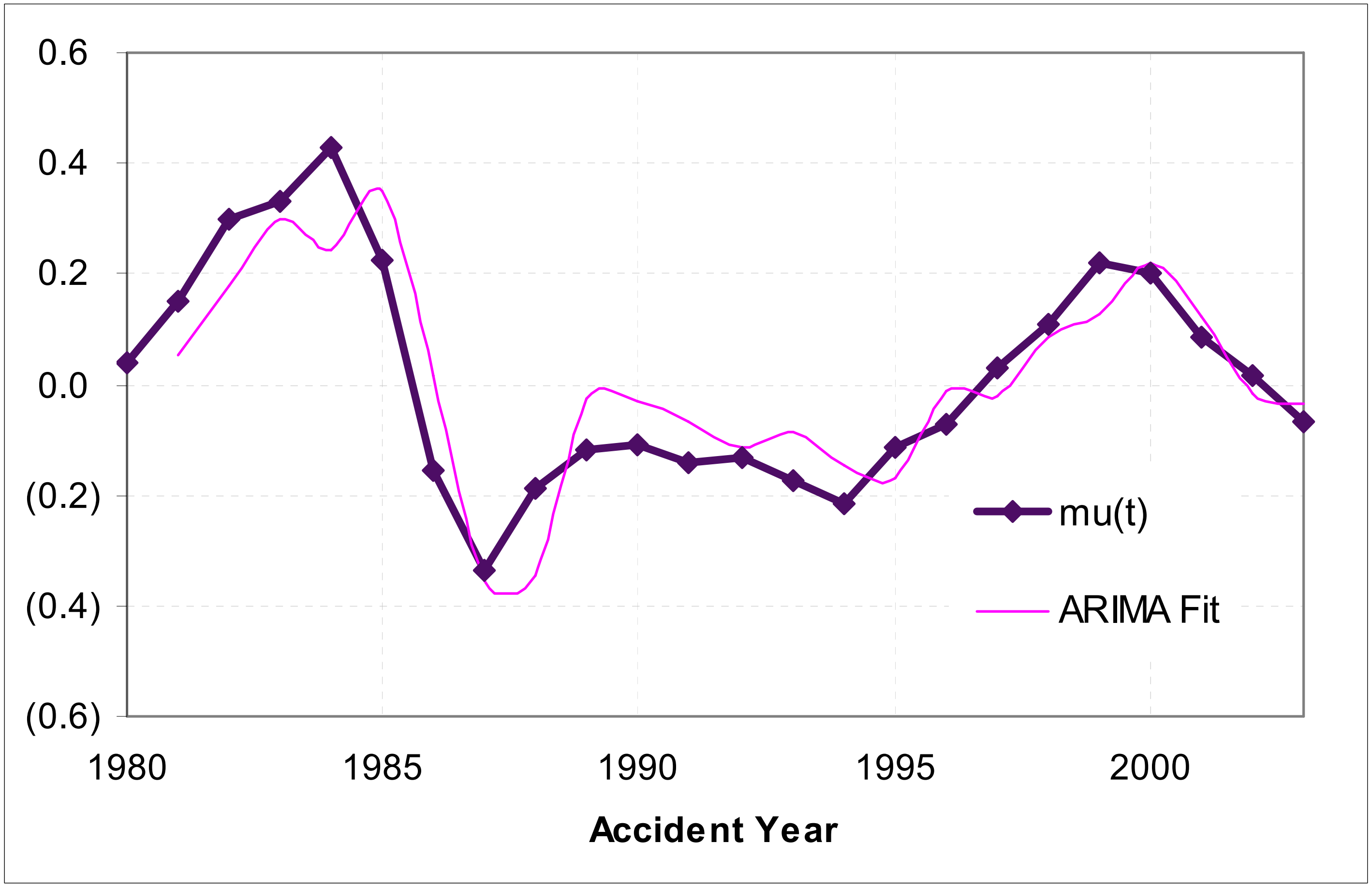
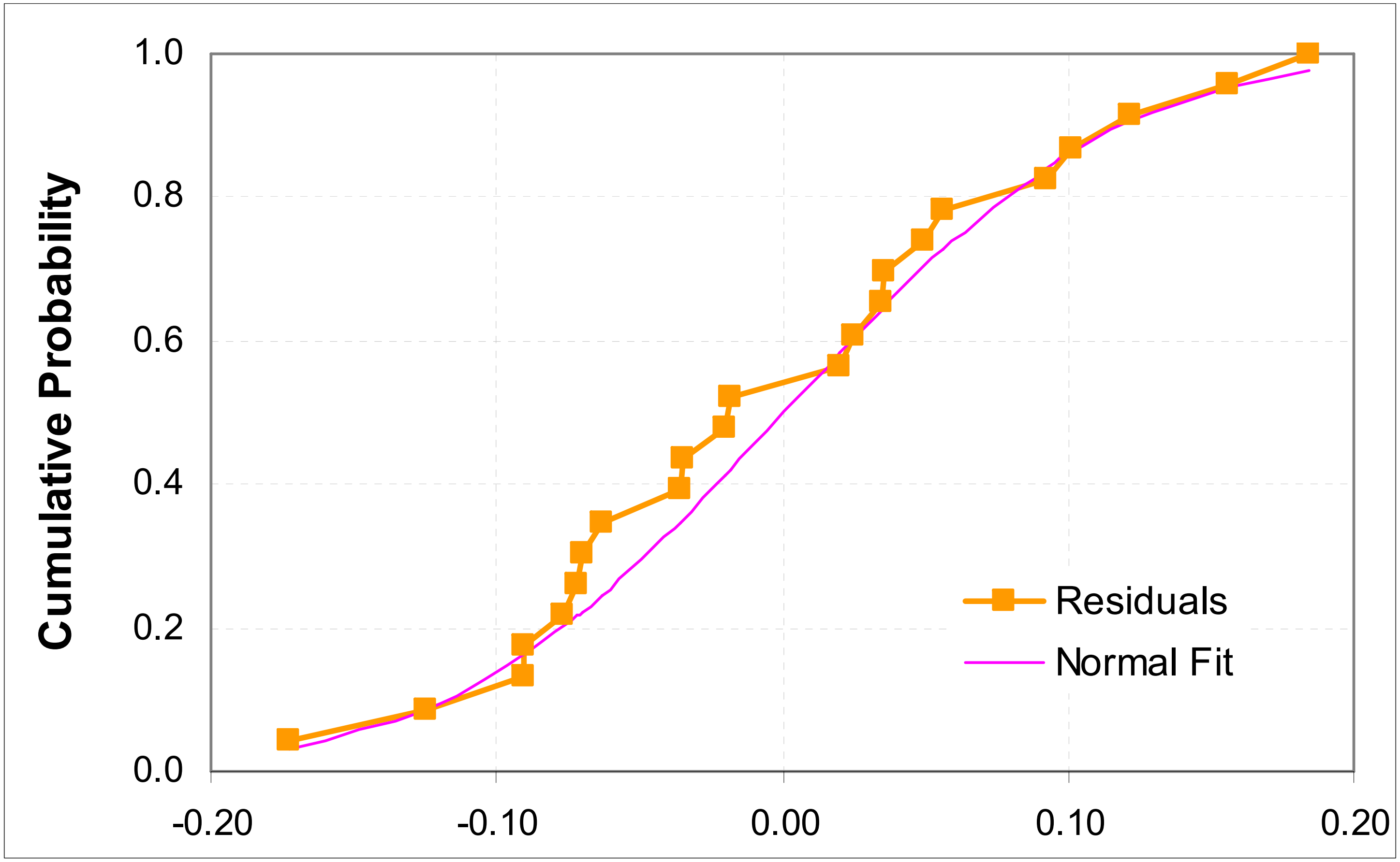
AR(2) MODEL


0.6
0.4
0.2
0.0
(0.2)
(0.4)
(0.6)
1980
1985
1990
1995
2000
Accident Year
mu(t)
ARIMA Fit

RESIDUALS OF AR(2) MODEL



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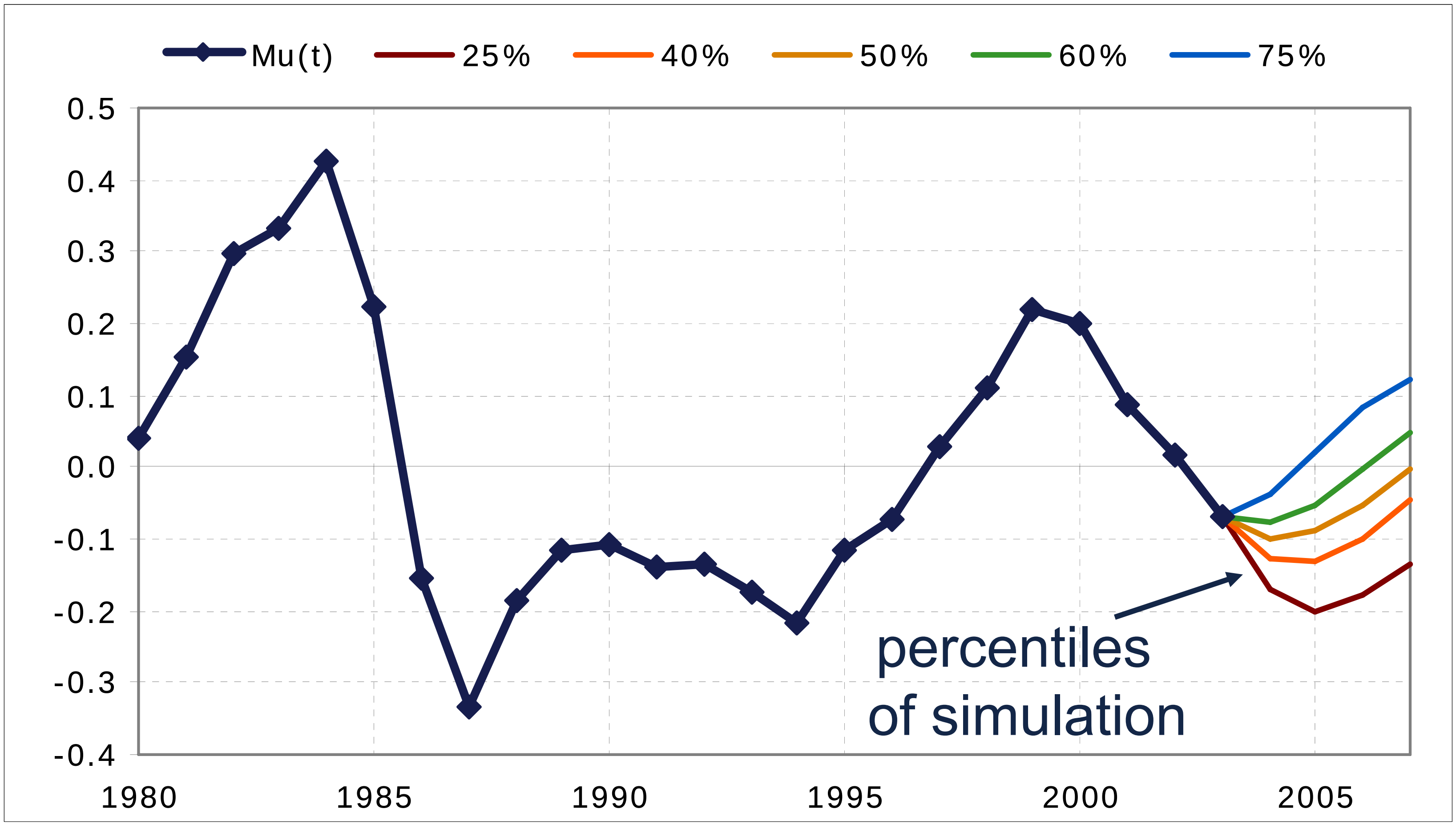
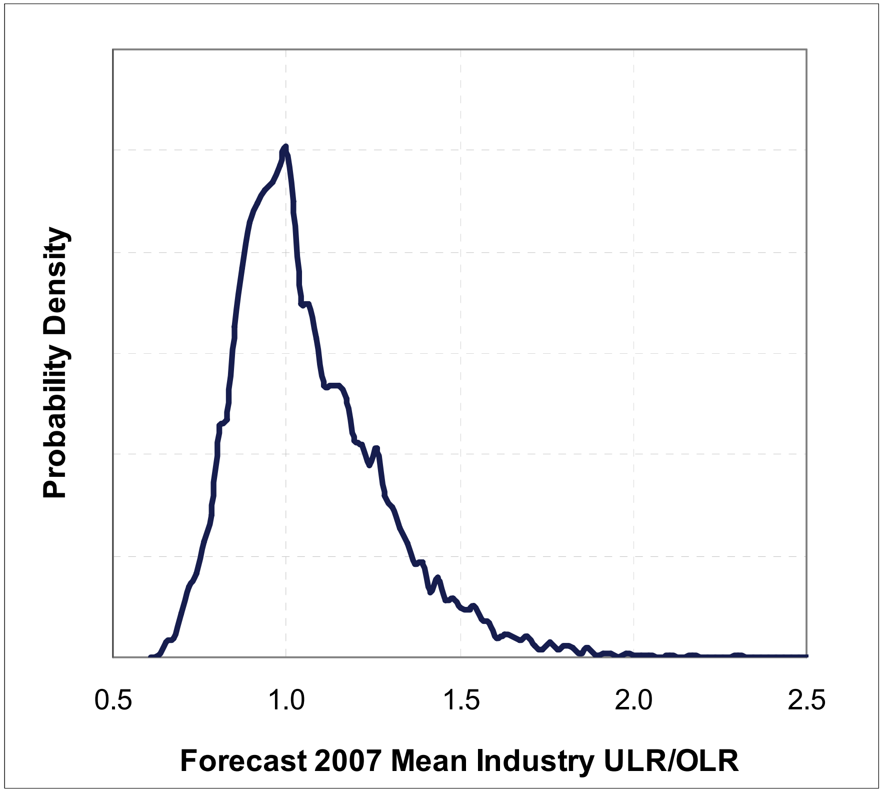
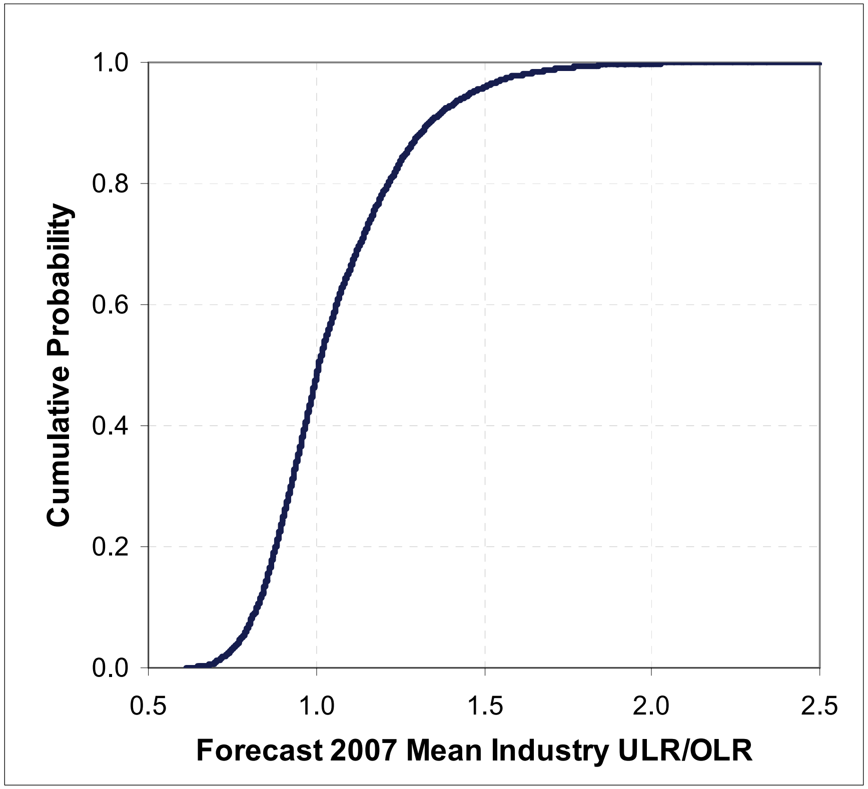
FORECASTING VIA SIMULATION



FORECASTING VIA SIMULATION





BACK-TESTING

Compared μ values fitted to data to the percentiles of the forecast distributions

	Observed	Observed Percentage		Theoretical
Quintile	Count	Incremental	Cumulative	Cumul. %
1	4	27%	27%	20%
2	2	13%	40%	40%
3	5	33%	73%	60%
4	4	27%	100%	80%
5	0	0%	100%	100%
Total	15	100%	100%	100%

Observations fit theoretical quintiles reasonably well

OBSERVATIONS

Do not necessarily expect future μ values to fall at the center of forecast distribution

- Not a precise point estimate of future μ
- Not a crystal ball to predict shifts in market

However, useful in predicting the range of future μ values

- How likely is the industry to get it wrong, and by how much?

CAVEATS

- Imperfect data
- ULR approximation
- External “shock” influences
- Intrinsic “component” influences
- Company-specific behavior

Note: back-testing suggests tail of forecast may be somewhat conservative… but with only 15 data points cannot draw firm conclusion

CONCLUSIONS

- Advantages of top-down approach
  - By its nature, incorporates all sources of estimation error
  - Does not require contemplation of dependencies among them
- Time series analysis can help quantify the likelihood and magnitude of estimation error for current and future accident years at the industry level
- May be useful in
  - Stress testing
  - Making reinsurance decisions
  - Conducting dynamic financial analysis
  - Applying enterprise risk management techniques

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