CAS Public Loss Simulator

Modeler:

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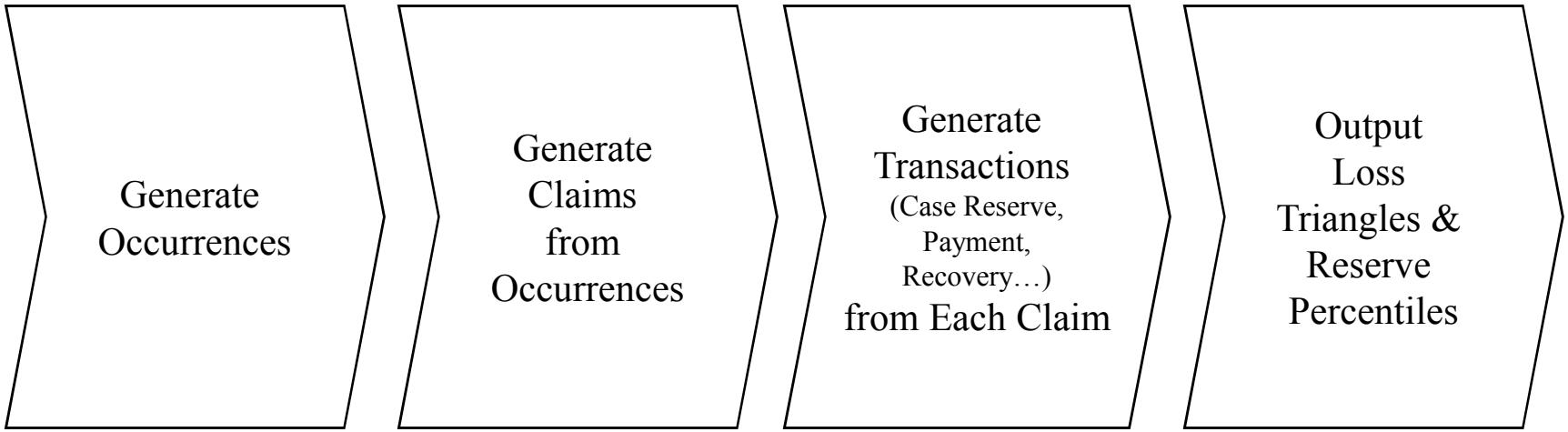
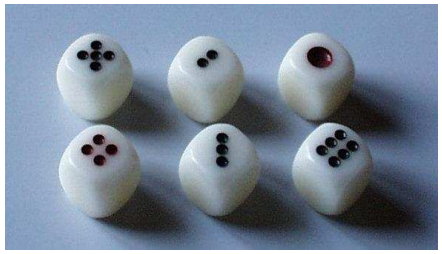
Model Consideration

What to Model? Loss process at the claim transaction level



Frequency
Severity
Lags
Case Reserve
Recovery (Subrogation)



(Phase 1: Single Payment Pattern)

Frequency

Frequency distribution is defined at the Line level, as an "accident" or "occurrence“ annual frequency. Simulator would then convert the annual frequency to "monthly frequency“ using:

- Exposure
- Trend
- Seasonality

From Occurrence to Claim

(Multinomial claim distribution)

Just an Example:

For one simulated occurrence, 60% of claims involve a single Physical Damage claim, 20% involve a single Physical Damage claim and a single Property Damage claim, 10% involve single Bodily Injury claim, 8% involve one Property Damage and one Bodily Injury claim, and 2% involve one Property Damage and two Bodily Injury claims.

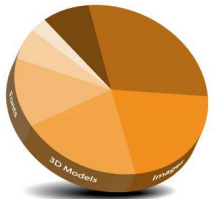
Physical Damage	Property Damage	Bodily Injury	Proportion	Normalized Probability
1	0	0	60	0.60
1	1	0	20	0.20
0	0	1	10	0.10
0	1	1	8	0.08
0	1	2	2	0.02

Note:

- The (user input) matrix is used to generate aggregate distributions of claims by coverage and month, and any connection between the specific accident and the claims it generates is lost in the output.
- Thus, any claims simulated from an accident (occurrence) are **NOT** tied to that accident.

Severity: Claim Size

- Size of Loss, follows a distribution
- Correlation with Payment Lag
- Deductible
- Limit
- Trend



- P(0): possibility of closure without payment

Severity: Case Reserve

- Case Reserve Adequacy interpolation
- Fast Track
- Minimum Change

To model changes in case reserve adequacy as information about a loss accumulates, the user specifies a mean adequacy factor as of the report date and as of 40%, 70%, and 90% of the time between the report date and the payment date. The system interpolates the mean of the case reserve factor between these values and between the "90% date" value and 1.00 at the payment date, and the system adjusts the standard deviation in the same proportions, except for reducing it linearly to zero between the "90% date" and the payment date. However, the case reserve itself only changes at discrete (and random) points in time determined by the distribution of inter-valuation waiting times.

Severity: Subrogation & Recovery

- P(1), probability that claim close with initial payment amount

- Initial Payment Adequacy follows a distribution

- Recovery Lag follows a distribution

Fact: “error” could happen in payment amount that may require a later correction, usually a subrogation or recovery

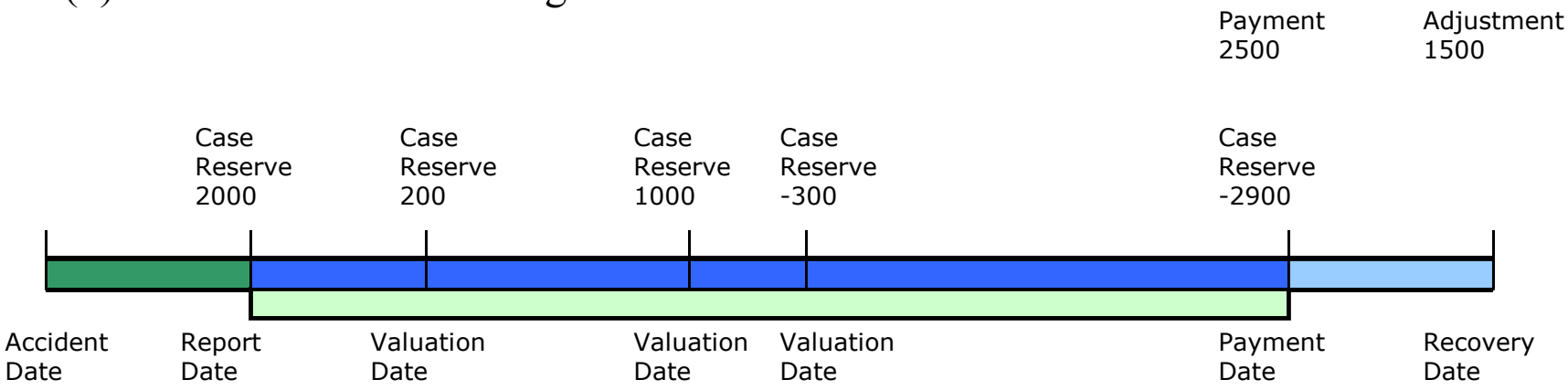
Claim Time line (Lags)

(1) Report Lag

(2) Payment Lag

(3) Recovery Lag

(4) Inter Valuation Time Lag



Correlation (Copula, Copula, Copula…)

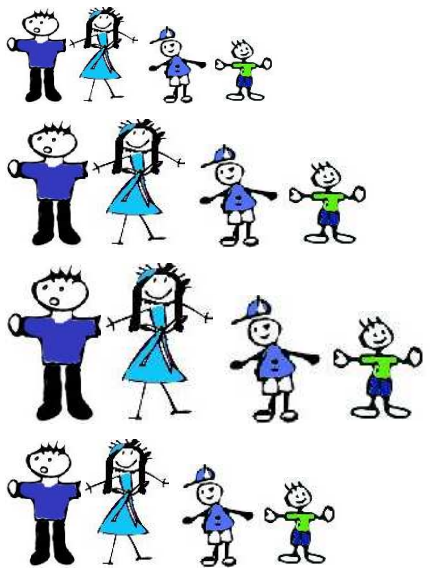
- Correlation is modularized in the Simulator
- Correlation is achieved by Copula

Correlations applied in Phase 1 Simulator:

1. Frequencies among lines.
2. Payment lag and size of claim.

Is Copula scary?

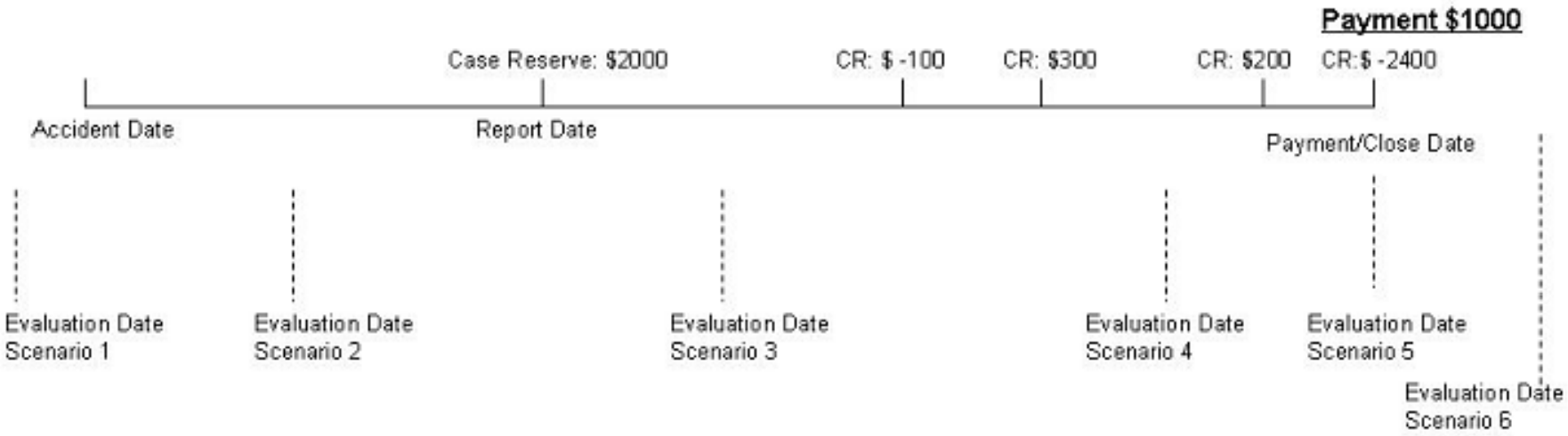
- Without Copula, draw four individual people each time: man, woman, girl and boy;
- With Copula, draw a family each time: dad, mom, sister and brother.



Simulation Result

(From Claim Transactions to Triangle)

For any given line of business, suppose there is one claim, and its transaction history time line is simulated as below. Our Loss Simulator will allow user pick different Evaluation Date to mimic the real life reserve analysis.



Evaluation Date Scenario	Note	Paid	Incurred (paid + case reserve)	Open Count	Closed With Payment Count	Closed without Payment Count
1	claim is not happened yet, so it is ignored					
2	the claim is not reported, so it is ignored also					
3	Use Accident Date to age	0	+2000	+1	0	0
4	Use Accident Date to age	0	+2200	+1	0	0
5	Use Accident Date to age, claim is just matured	+1000	+1000	0	+1	0
6	Use Accident Date to age, claim is matured	+1000	+1000	0	+1	0

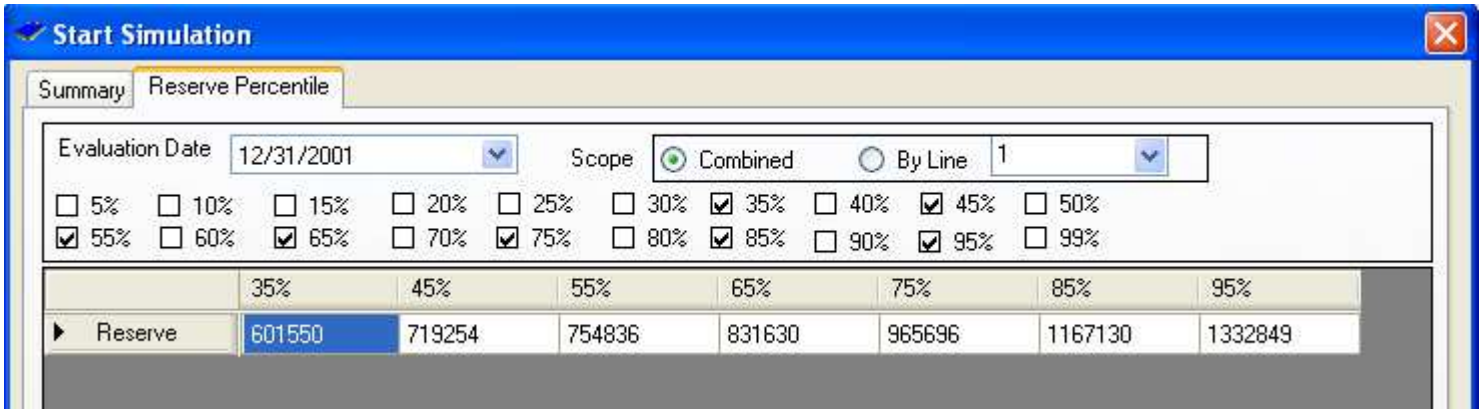
Simulation Result

(From Claim Transactions to Reserve Percentiles)

Simulation	Claim No	Date	Transactio	Case Rese	Payment
1	4	20000915	REP	2000	0
1	4	20010522	CLS	-2000	0
1	5	20000913	REP	2000	0
1	5	20001020	RES	320868	0
1	5	20010111	RES	-185753	0
1	5	20010403	CLS	-137115	164488
1	6	20000925	REP	2000	0
1	6	20001118	RES	26666	0
1	6	20010206	RES	-13809	0
1	6	20010325	RES	-8174	0
1	6	20010429	CLS	-6683	17337
1	7	20001004	REP	2000	0
1	7	20001123	RES	325286	0
1	7	20001127	RES	-32565	0
1	7	20010313	RES	-238647	0
1	7	20010404	CLS	-56074	197257

- The model will help people to evaluate the results from different methods of calculating reserve ranges.

- The model will also enable researchers to test the accuracy of different reserving methods and models for different situations.

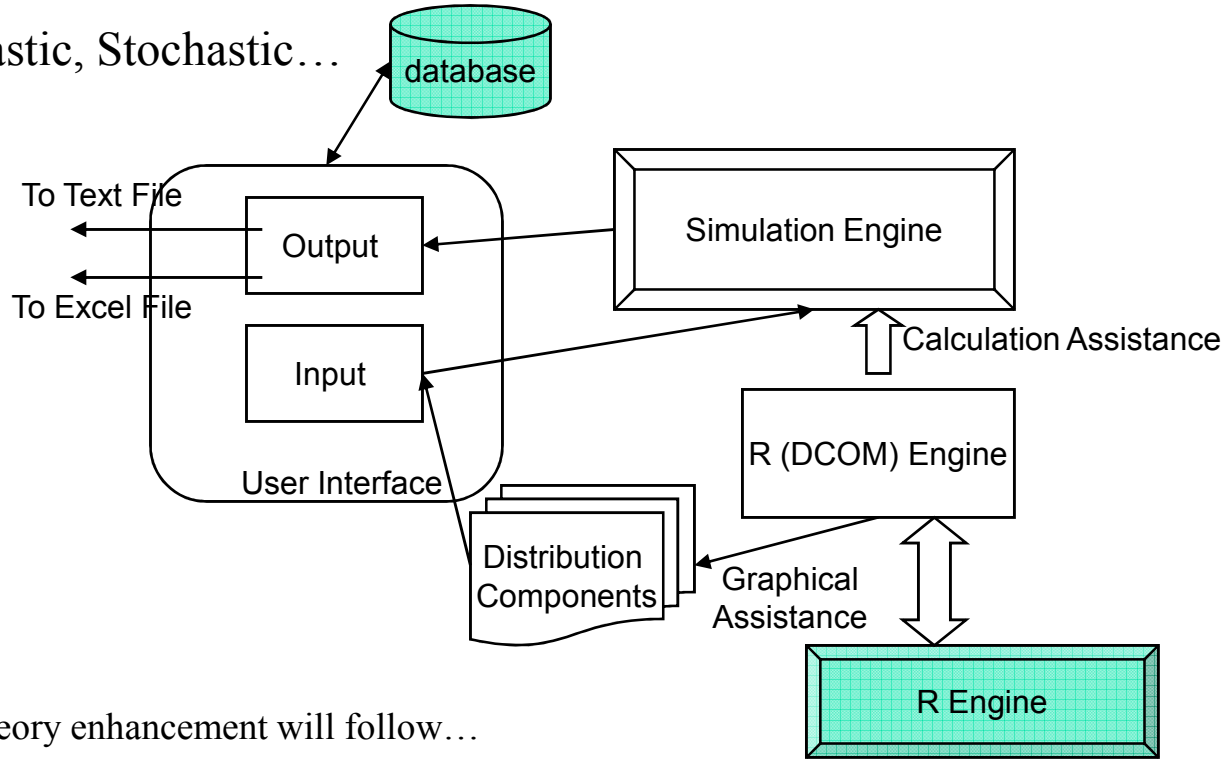


Architecture

- Flexibility
- Speed
- Easy to use
- Stochastic, Stochastic, Stochastic…

Open Environment:

VB.NET + R



More system/model/theory enhancement will follow…