

DEEP LEARNING FOR STOCHASTIC POLICY-LEVEL MODELLING

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Sell-Side Technology
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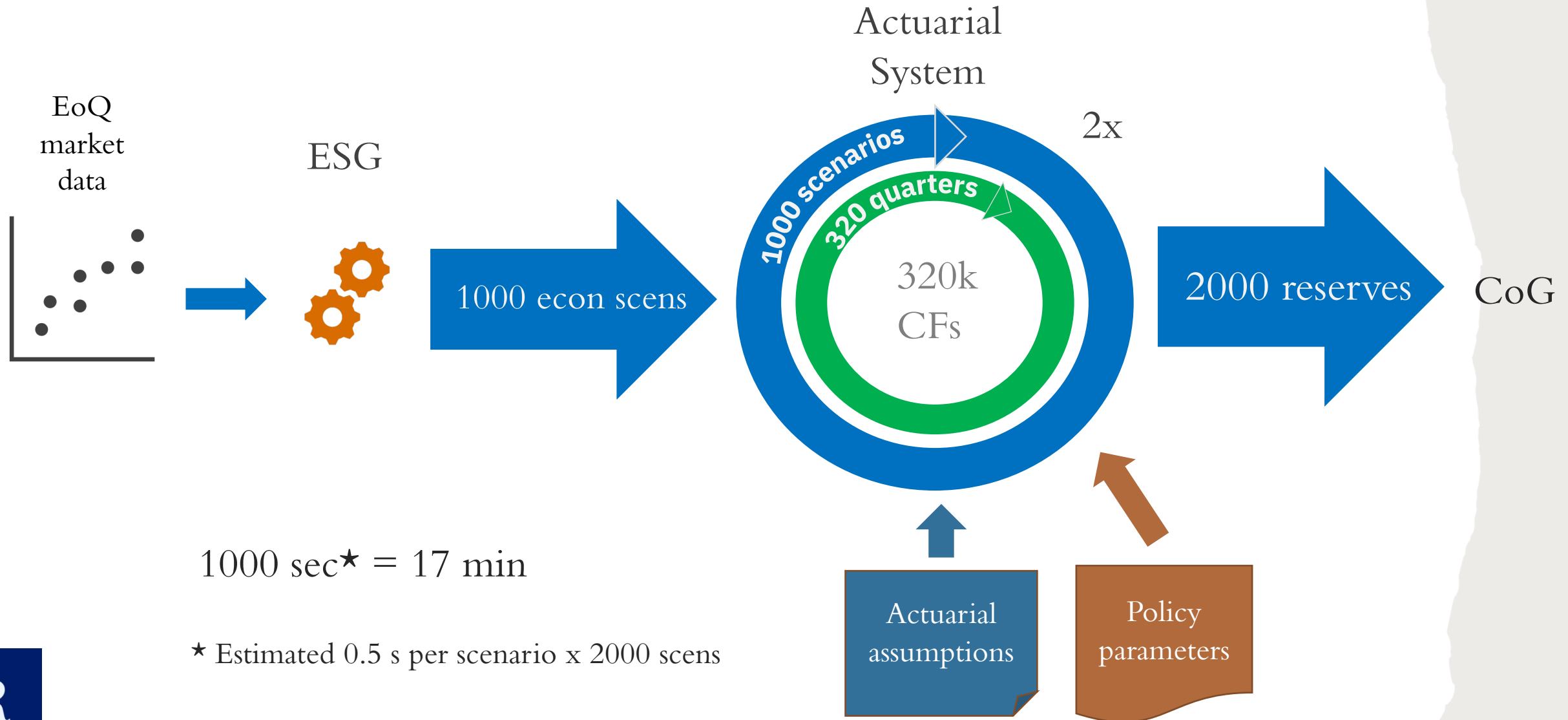


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Monday 7th June 2021

TYPICAL SERIATIM PROCESS



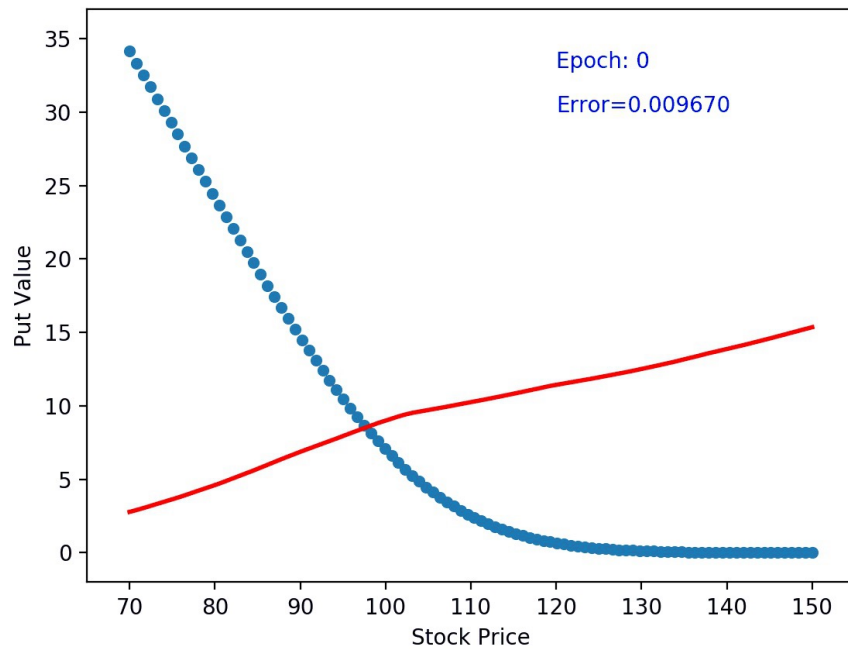
SHORT HISTORY OF DEEP LEARNING

Using Neural Networks to Price and Hedge Variable Annuity Guarantees

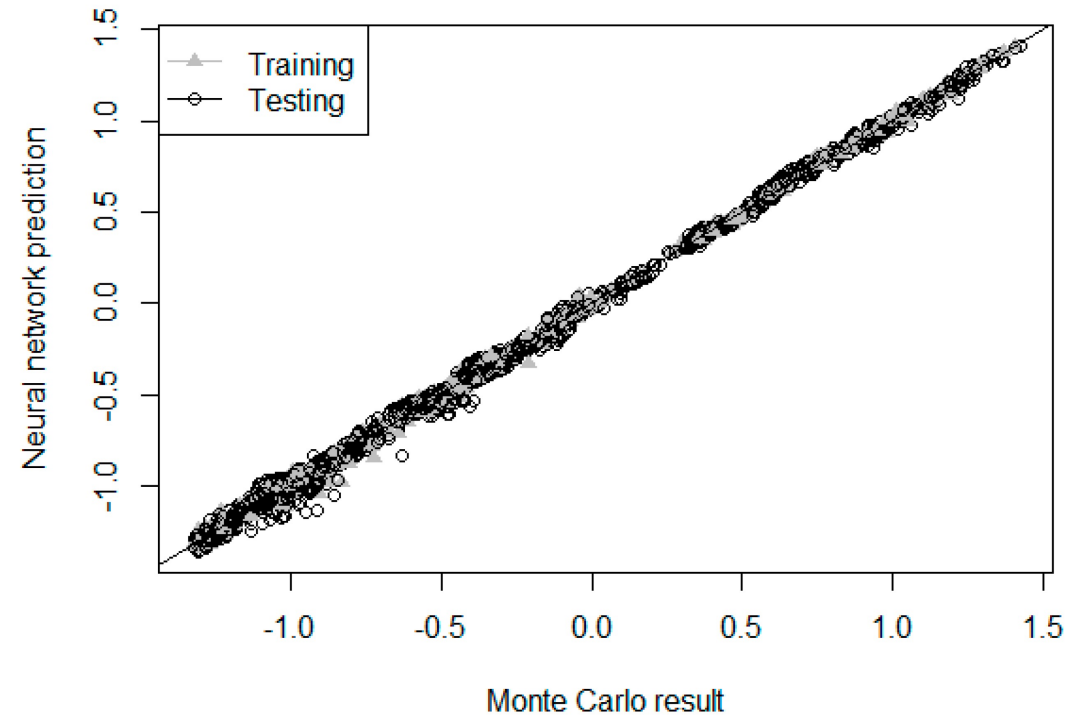
by [Daniel Doyle](#)¹ and [Chris Groendyke](#)^{2,*} [✉](#)

Risks, 2019

Put option

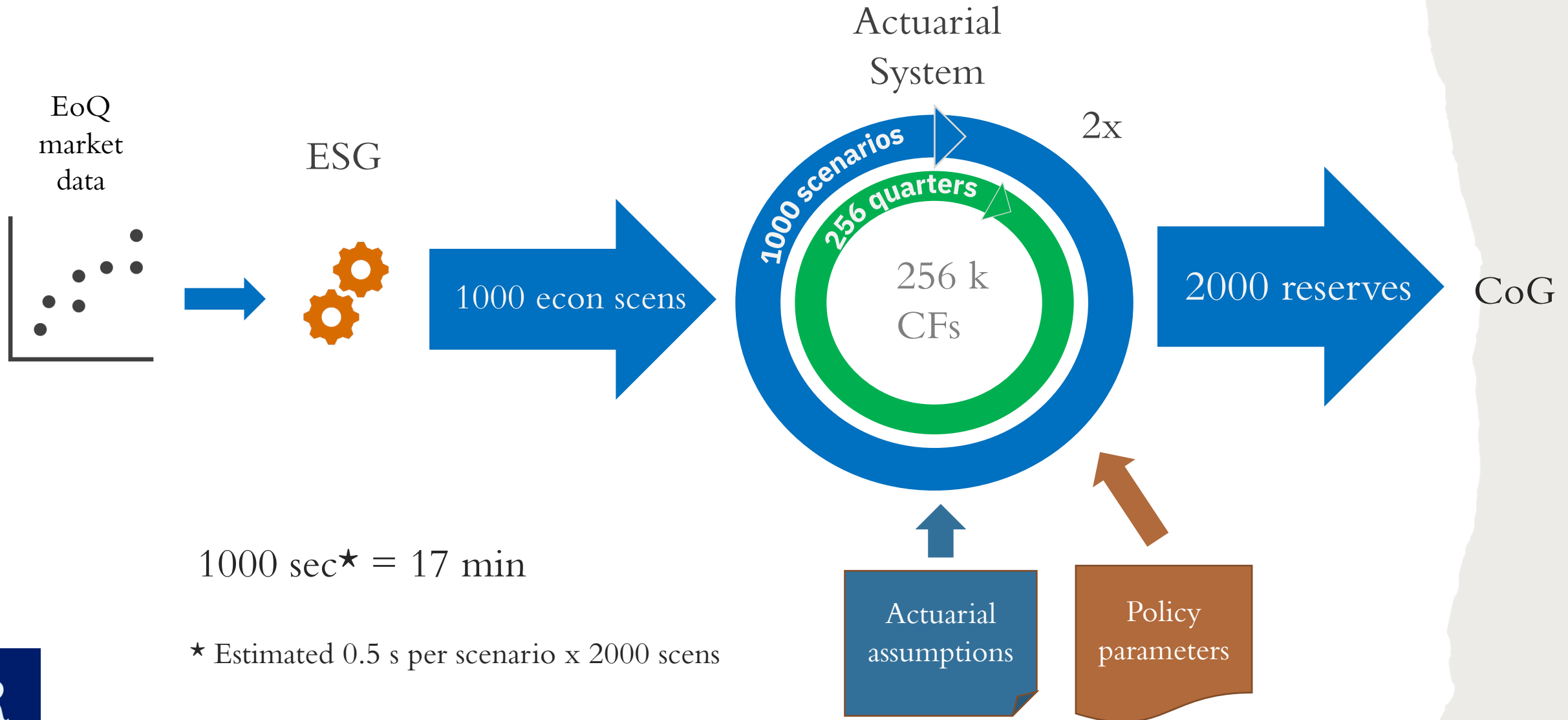


GMDB: MC vs. NN accuracy with 500 training points

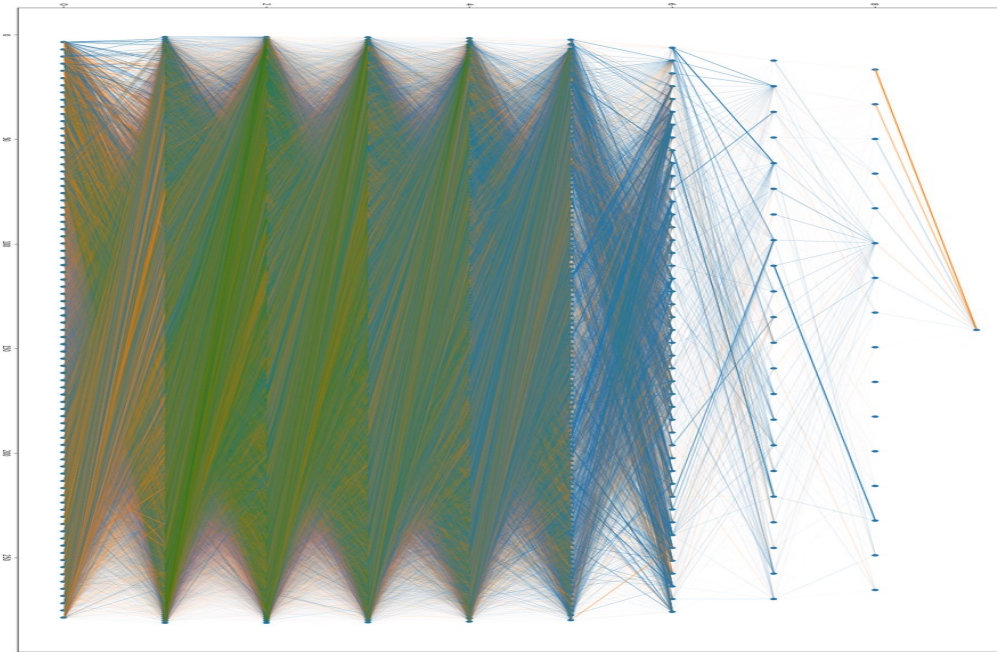
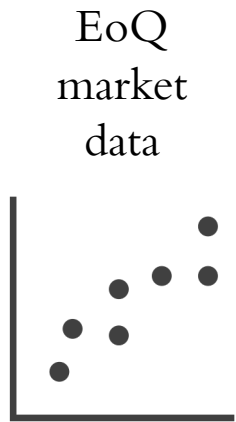


10 inputs, shallow net with 10 hidden neurons

TYPICAL SERIATIM PROCESS

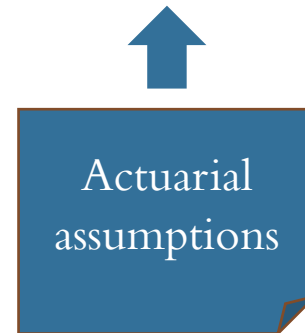


NEURAL NET APPROXIMATION

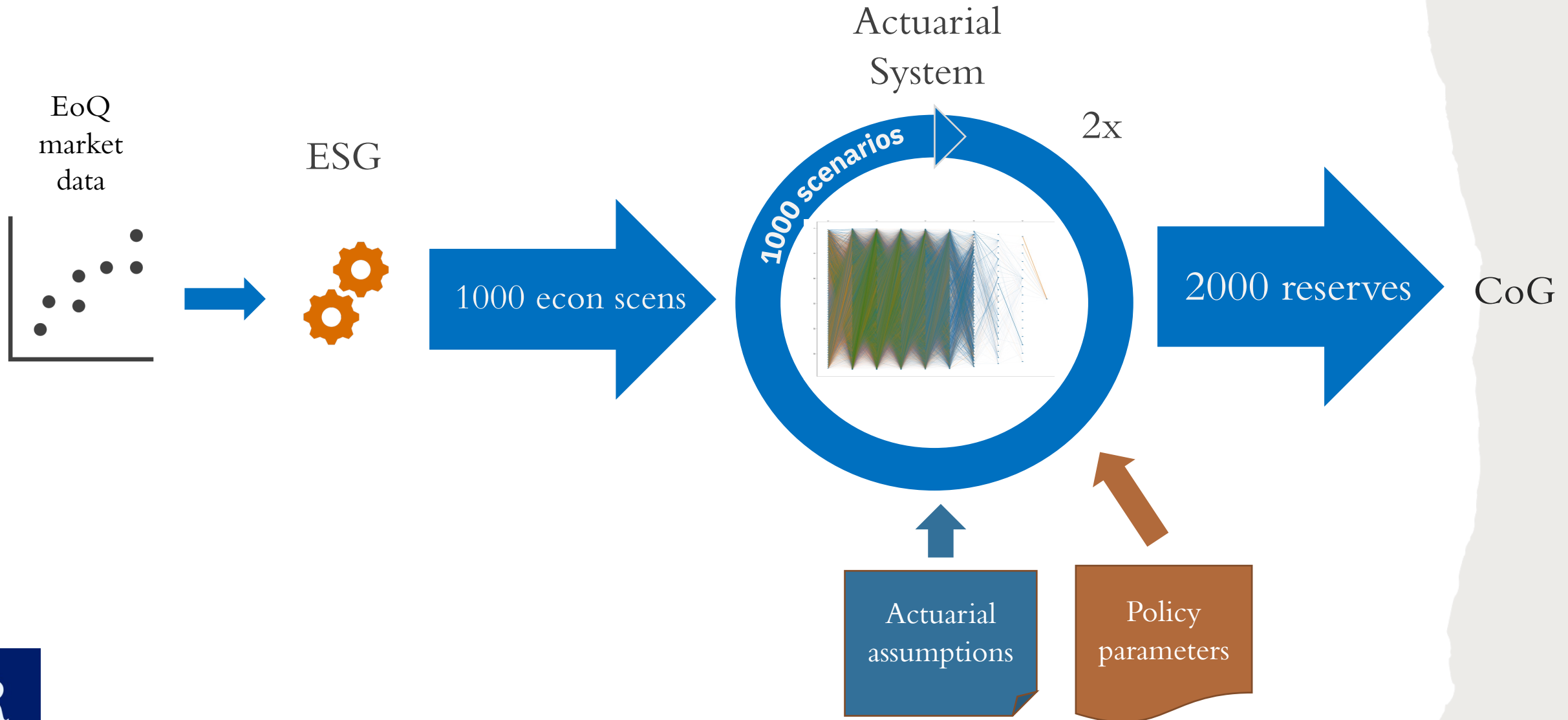


CoG

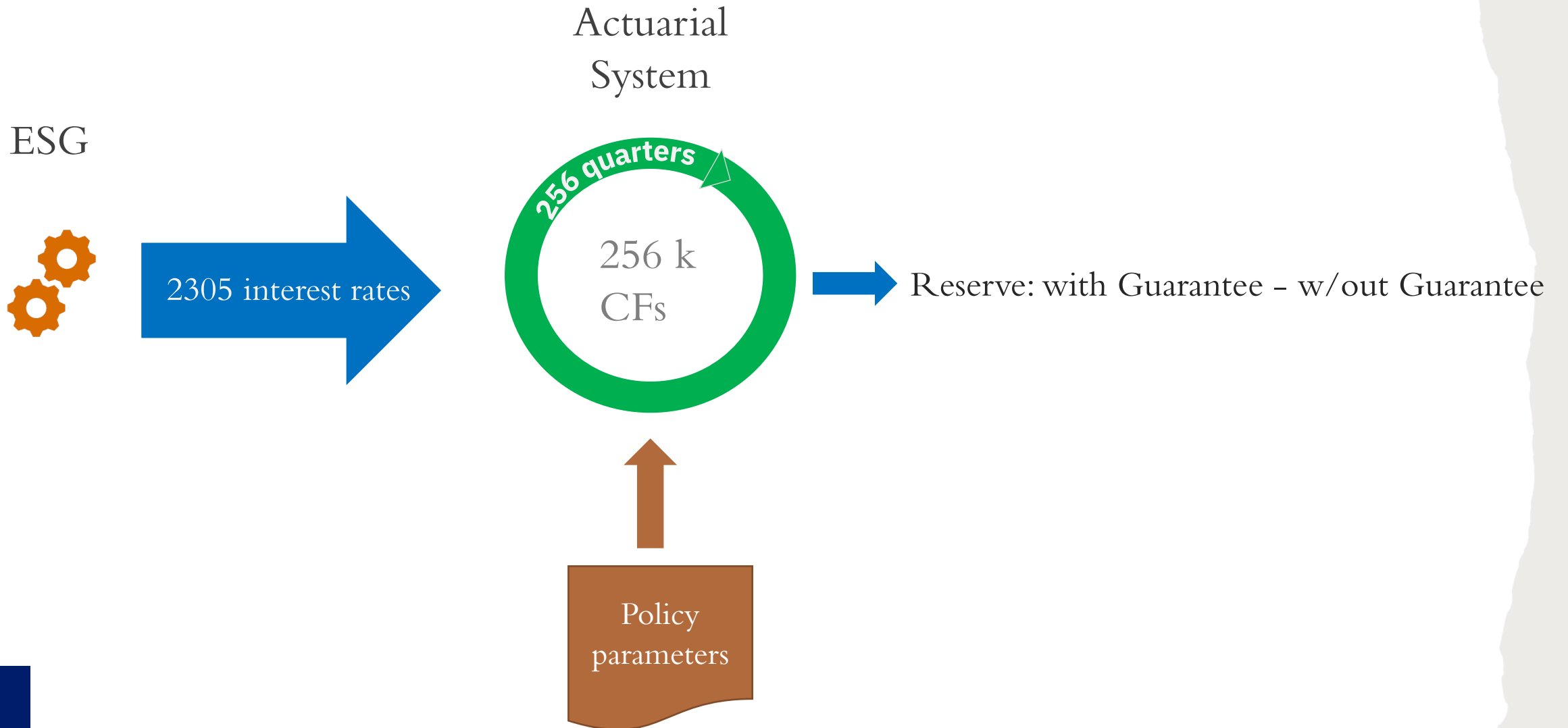
0.002 sec per policy



IMITATE ACTUARIAL SYSTEM

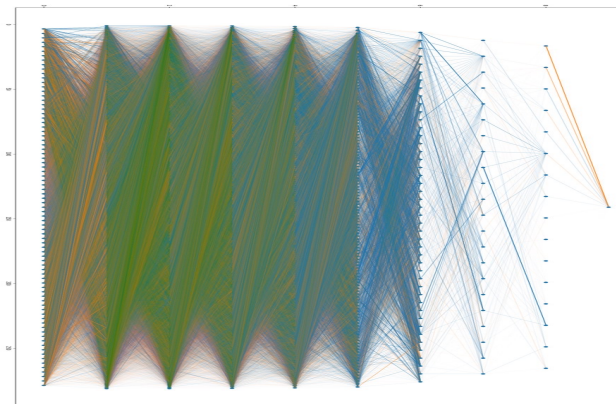


IMITATE ACTUARIAL SYSTEM



IMITATE ACTUARIAL SYSTEM

ESG



Reserve: with Guarantee - w/out Guarantee



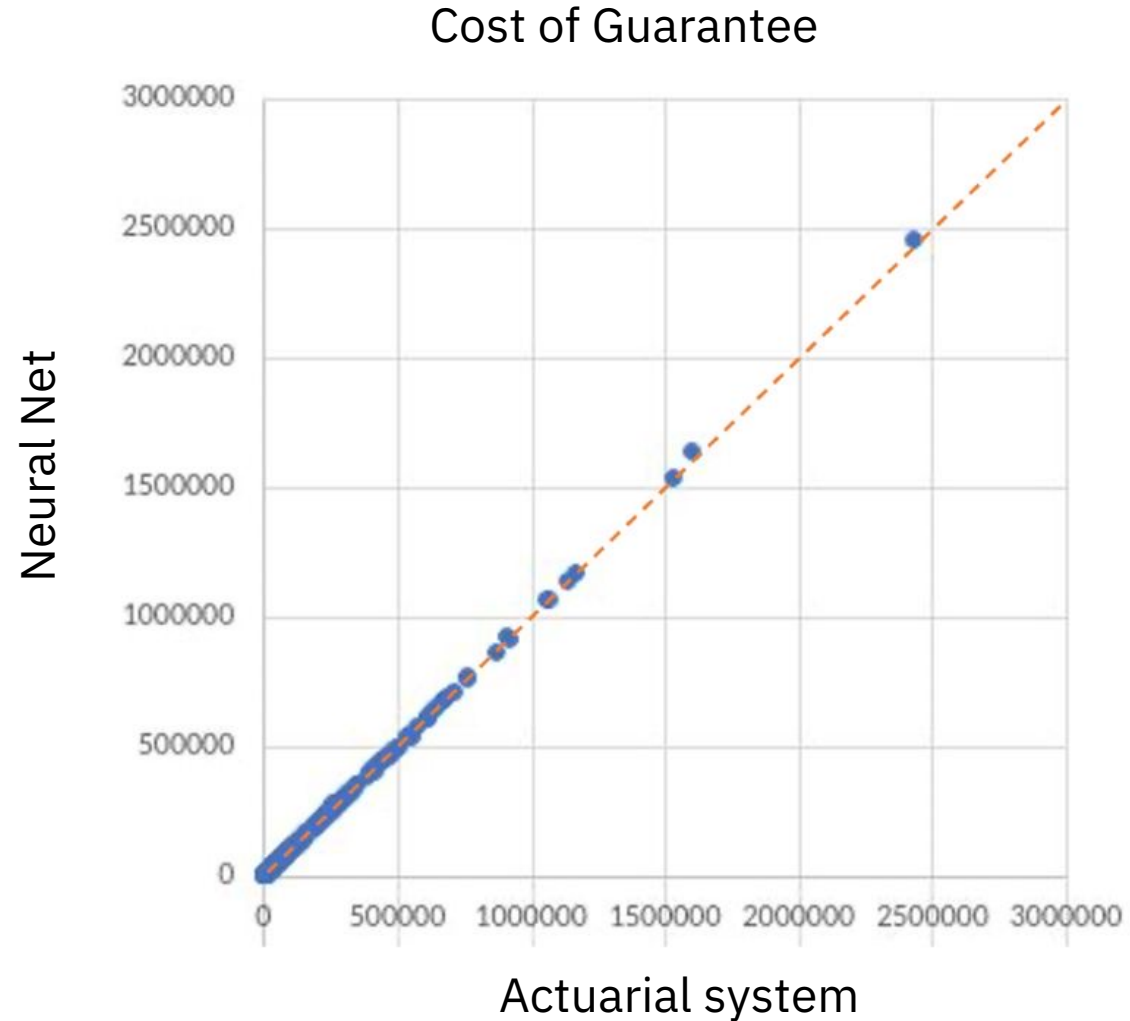
LARGE SCALE RESULTS

Neural Network parameters:

- Inputs (2,344 total) :
 - Interest rates
 - Policy Age
 - Premiums
 - Coverage volumes
 - Account balances
- Hidden layers – 7x256
- Outputs:
 - Value with Guarantee
 - Value w/out Guarantee

Training set:

- 100 000 interest rate scenarios
- 200 policies



THANK
YOU

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