



# Can Generative AI Replace a Decision Analyst

Hubbard Decision Research  
25410 Canterbury Ct  
Glen Ellyn, Illinois 60137  
[www.hubbardresearch.com](http://www.hubbardresearch.com)

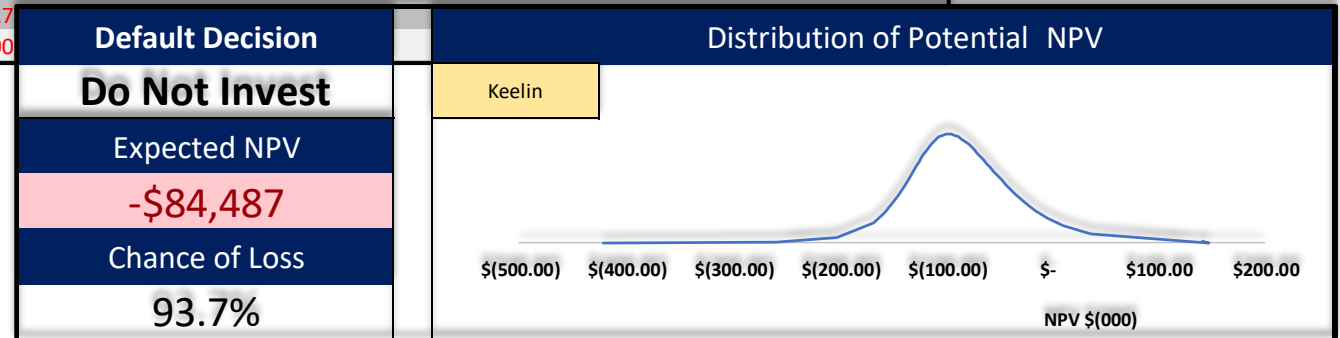


# Using Monte Carlos Models for Decision Making

1. Define uncertainty using data or subjective estimates
2. Design a cashflow to calculate NPV
3. Run simulations
4. Record and analyze results

Variable Name	Simulated Value	Shape	Lower Bound (P5)	Mode, P, or P50	Upper Bound (P95)
<b>Buy Option</b>					
Annual Insurance	1137.53	Lognorm	\$ 1,000		\$ 2,000
Annual HOA Fees	5342.46	Normal	\$ 4,000		\$ 8,000
Unique to Home-Ownership	1716.60	Lognorm	\$ 500		\$ 2,500
Other Annual Benefits from Home Ownership	964.31	Triangular	\$ -	\$ 1,000	\$ 2,000
Housing/Rent Average Annual Increase					
Discount Rate/Cost of Capital					

Years	0	1	2	3	4	5
<b>Net Cashflow</b>	(\$102,087)	(\$30,061)	(\$28,763)	(\$27,395)	(\$25,954)	\$137,527
Value of Home	\$375,000	\$395,112	\$416,302	\$438,629	\$462,154	\$486,940
Value of Equity	\$78,351	\$102,039	\$127,045	\$153,444	\$181,312	\$210,733
Value of Alternative Investments	\$106,439	\$142,319	\$178,376	\$214,544	\$250,751	\$286,917
Renting Cashflows	(\$23,940)	(\$25,224)	(\$26,577)	(\$28,002)	(\$29,504)	(\$31,086)
Home Ownership Cashflows	(\$126,027)					
Upfront Cost	(\$75,000)					



[https://hubbardresearch.com/a-quants-approach-to\\_buying-vs-renting/](https://hubbardresearch.com/a-quants-approach-to_buying-vs-renting/)

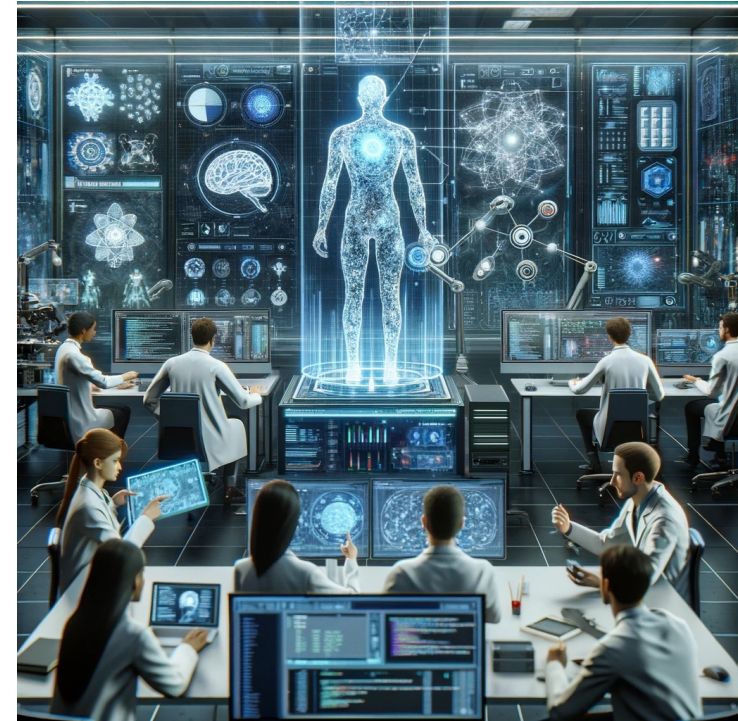


# Measuring Chat GPT Calibration for CI Intervals

Chat GPT 3.5 and 4 have a data cutoff point of September 2021 and January 2022\*

We prompted Chat GPT to provide 90% confidence interval responses to events after its cutoff date

We repeated this process for different sessions and different temperature settings (variability between session responses)



***\*Experiment was conducted before Chat GPT 4's cutoff date was updated to April 2023***



# Measuring Chat GPT Calibration for CI Intervals



	% Within 90% CI	Sample Size
ChatGPT 3.5	13.5%	140 (20 events, 7 sessions)
ChatGPT 4, Temperature = 1	60%	360 (20 events, 18 sessions)
ChatGPT 4, Temperature = 0	61%	80 (20 events, 4 sessions)
Humans, general trivia	~55%	10,000+ (1000+ humans)

***“How much will the top-grossing film earn internationally at the box office in 2022?”***

<https://hubbardresearch.com/is-chatgpt-as-overconfident-as-humans/>



# Calibrating Chat GPT Responses

Overconfidence remains consistent for another set of questions



	% Within 90% CI	Sample Size
ChatGPT 4 Before Adjustment	64.5%	62 (1 session)
Chat GPT 4 After Adjustment	89.6%	31 (Resampled 1000 times)

Adjustment was calculated on a training data set of questions

***Forecasts were based on items on variety topics such as sports, politics, economics, etc.***



# Chat GPT Filled in Template

**AIE Risk/Return Analysis Template: Variable Input**

Instructions: Describe the Variables you want to use in your simulation here. Each distribution has a "Shape" (aka, probability distribution). The simulated values for each variable defined on this page can be used on the "Decision Model" page to create a multi year cashflow. Used the "Update Short Names" button to create defined names for these values. This allows the variables to be more easily referenced by their short name. The simulated values change with each scenario number and are recorded in the "MC Simulation" tab. Always recalculate by pressing the "Calculate Now" button in cell I6 after making changes. Detailed calculations are grouped under hidden columns. Click on More calculations to the right. Un-collapse columns. >>>

Scenario #	1	Expected NPV	\$ -	Scenario NPV	\$ -
# of Potential Variables for Model	150	Base EOJ	\$ -	Default Action (I=Invest)	0
	<input type="button" value="Update Short Names"/>	P(NPV<0)	0.0%	Sum of Individual EVPIs	\$ -

VarID	Variable Name	Short Name	Simulated Value	Shape	Lower Bound (P5)	Mode, P, or PS0	Upper Bound (P95)	Notes
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

**AIE Risk/Return Analysis Template: Decision Model**

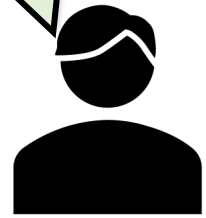
Instructions: This tab provides a blank slate for building out a cash flow or other form of decision model. HDR recommends defining "short names" for each variable on the variables tab and referring to those in your logic. Make sure to compute a NPV for the scenario in cell D7. Try using the slider bar to change scenario number and ensure that values are changing as they should be.

<b>Scenario Summary</b>		Discount Rate	8%
Scenario #	1	NPV	\$ -
		Optional Metric 1	
		Optional Metric 2	

Years: 1 2 3 4 5 6 7 8 9 10

Net Cashflow

*"I can invest in a 2 bedroom-1 bath rental property in DC for \$1.1 million. If I buy it, I will likely sell it in 10 years. A mortgage rate quote I received was 5%, with a 20-year term and the discount rate I would use is 8%. Assume I will sell it in 10 years and pay off what is left of my mortgage with the cashflow from the sale."*



Prompted Chat GPT to use the model template via packages in Python



# Chat GPT Filled in Template: Cont.

**AIE Risk/Return Analysis Template: Variable Input**

Instructions: Describe the Variables you want to use in your simulation here. Each distribution has a "Shape" (aka, probability distribution). The simulated values for each variable defined on this page can be used on the "Decision Model" page to create a multi-year cashflow. Use the "Update Short Names" button to create defined names for these values. This allows the variables to be more easily referenced by their short name. The simulated values change with each scenario number and are recorded in the "MC Simulation" tab. Always recalculate by pressing the "Calculate Now" button in cell U6, after making changes. Detailed calculations are shown under hidden columns. Click on More calculations to the right. Uncollapse columns. >>>

Scenario #	Expected NPV	Base EOL	P(NPV<0)	Scenario NPV	Default Action (1=Invest)	Sum of Individual EVPIs
1	\$ (300,191)	\$ 45	99.7%	\$ (268,824.18)	0	-

VarID	Variable Name	Short Name	Simulated Value	Shape	Lower Bound (P5)	Mode, P, or P50	Upper Bound (P95)	Notes	Adj P5	Adj P50	Adj P95	EVPI Estimate
1	Property Price	PropPrice	1100000	Constant		1,100,000.00		Fixed property price	\$ -	\$ -	\$ -	\$ -
2	Mortgage Rate	MortRate	0.05	Constant		0.05		Quoted mortgage rate	\$ -	\$ -	\$ -	\$ -
3	Mortgage Term	MortTerm	20	Constant		20.00		Mortgage term in years	\$ -	\$ -	\$ -	\$ -
4	Discount Rate	DiscRate	0.08	Constant		0.08		Discount rate for NPV calculation	\$ -	\$ -	\$ -	\$ -
5	Property Sale Price	SalePrice	1590105.883	Triangular	1,100,000.00	1,300,000.00	1,500,000.00	Estimated sale price in 10 years	\$ 940,000	\$ 1,300,000	\$ 1,940,000	\$ -
6	Annual Rent	Rent	32892.77287	Triangular	30,000.00	35,000.00	40,000.00	Estimated annual rent	\$ 26,000	\$ 35,000	\$ 40,000	\$ -

Calibrated but wide

	Adj P5	Adj P95
MaintCost	\$ 3,000	\$ 15,500
TaxRate	0.6%	3.1%

**AIE Risk/Return Analysis Template: Decision Model**

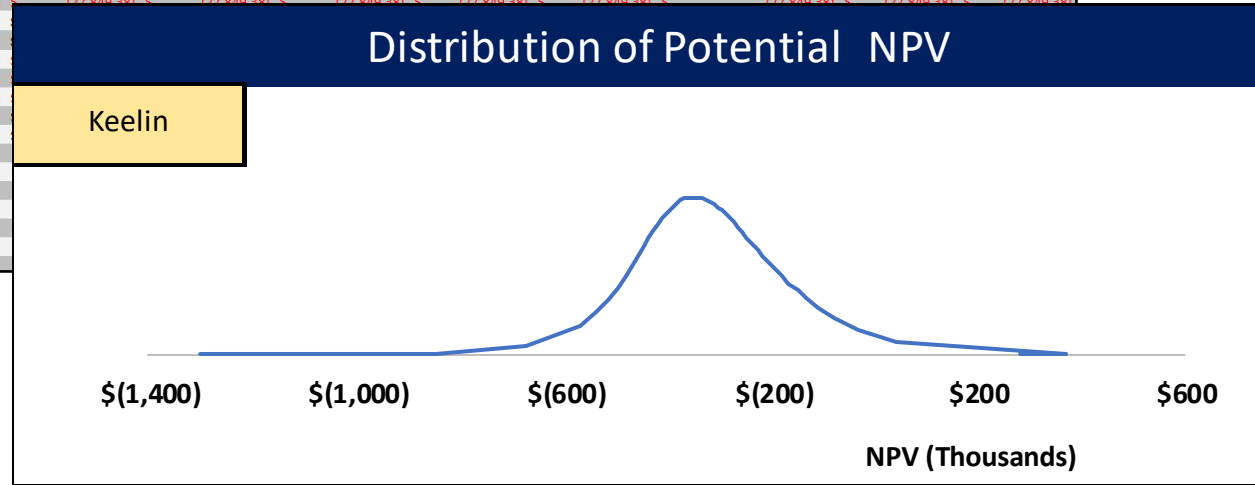
Instructions: This tab provides a blank slate for building out a cash flow or other form of decision model. It recommends defining "short names" for each variable on the variables tab and referring to those in your model. Make sure to compute a NPV for the scenario in cell D7. Try using the slider bar to change scenario number and ensure that values are changing as they should be.

Scenario #	NPV	Discount Rate
1	\$ (268,824)	8%

	1	2	3	4	5	6	7	8	9	10
Net Cashflow	\$ (1,098,037.63)	\$ 1,962.37	\$ 1,962.37	\$ 1,962.37	\$ 1,962.37	\$ 1,962.37	\$ 1,962.37	\$ 1,962.37	\$ 1,962.37	\$ 1,592,068.25
Benefits	\$ 29,811.75	\$ 29,811.75	\$ 29,811.75	\$ 29,811.75	\$ 29,811.75	\$ 29,811.75	\$ 29,811.75	\$ 29,811.75	\$ 29,811.75	\$ 1,619,917.63
Costs	\$ (1,277,849.38)	\$ (27,849.38)	\$ (27,849.38)	\$ (27,849.38)	\$ (27,849.38)	\$ (27,849.38)	\$ (27,849.38)	\$ (27,849.38)	\$ (27,849.38)	\$ (27,849.38)
Initial Costs	\$ (1,000,000.00)	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Mortgage Payments	\$ 7,259.51	\$ 7,259.51	\$ 7,259.51	\$ 7,259.51	\$ 7,259.51	\$ 7,259.51	\$ 7,259.51	\$ 7,259.51	\$ 7,259.51	\$ 7,259.51
Maintenance Costs	\$ (11,396.83)	\$ (11,396.83)	\$ (11,396.83)	\$ (11,396.83)	\$ (11,396.83)	\$ (11,396.83)	\$ (11,396.83)	\$ (11,396.83)	\$ (11,396.83)	\$ (11,396.83)
Property Tax	\$ (2,529.69)	\$ (2,529.69)	\$ (2,529.69)	\$ (2,529.69)	\$ (2,529.69)	\$ (2,529.69)	\$ (2,529.69)	\$ (2,529.69)	\$ (2,529.69)	\$ (2,529.69)
Insurance Cost	\$ (1,182.38)	\$ (1,182.38)	\$ (1,182.38)	\$ (1,182.38)	\$ (1,182.38)	\$ (1,182.38)	\$ (1,182.38)	\$ (1,182.38)	\$ (1,182.38)	\$ (1,182.38)
Rent Revenue	\$ 9,811.75	\$ 29,811.75	\$ 29,811.75	\$ 29,811.75	\$ 29,811.75	\$ 29,811.75	\$ 29,811.75	\$ 29,811.75	\$ 29,811.75	\$ 29,811.75
Sale Revenue	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -

Distribution of Potential NPV



Simple mistakes made in cashflow formulas (-/+)



## Key Take Aways

---



We can obtain *calibrated, but wide*, confidence intervals for a set of subjective forecasts from Chat GPT

Chat GPT can be prompted to fill in initial template models, but requires human auditing for mistakes

Generative AI can be used to save time when creating decision models

Current versions of generative AI will not be replacing analysts

**.....For now**