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MONTE CARLO STAT ADD-IN USER GUIDE AND FEATURES ZAGROS ENTERPRISES LLC

https://zagrosenterprises.com/

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1. INTRODUCTION

1.1. MONTE CARLO SIMULATION

Monte Carlo simulation is a computerized mathematical technique that allows users to account for risk in quantitative analysis and decision making. The technique is used by professionals in such widely disparate fields as finance, project management, energy, manufacturing, engineering, research and development, insurance, oil & gas, transportation, and the environment.

Monte Carlo simulation furnishes the decision-maker with a range of possible outcomes and the probabilities they will occur for any choice of action. It shows the extreme possibilities the outcomes of going for broke and for the most conservative decision along with all possible consequences for middle-of-the-road decisions.

The technique was first used by scientists working on the atom bomb; it was named for Monte Carlo, the Monaco resort town renowned for its casinos. Since its introduction in World War II, Monte Carlo simulation has been used to model a variety of physical and conceptual systems.

1.2. HOW MONTE CARLO SIMULATION WORKS

Monte Carlo simulation performs risk analysis by building models of possible results by substituting a range of values—a probability distribution—for any factor that has inherent uncertainty. It then calculates results over and over, each time using a different set of random values from the probability functions. Depending upon the number of uncertainties and the ranges specified for them, a Monte Carlo simulation could involve thousands or tens of thousands of recalculations before it is complete. Monte Carlo simulation produces distributions of possible outcome values.

By using probability distributions, variables can have different probabilities of different outcomes occurring. Probability distributions are a much more realistic way of describing uncertainty in variables of a risk analysis.

Common probability distributions include:

I. NORMAL:

Or "bell curve." The user simply defines the mean or expected value and a standard deviation to describe the variation about the mean. Values in the middle near the mean are most likely to occur. It is symmetric and describes many natural phenomena such as people's heights. Examples of variables described by normal distributions include inflation rates and energy prices.

II. LOGNORMAL:

Values are positively skewed, not symmetric like a normal distribution. It is used to represent values that don't go below zero but have an unlimited positive potential. Examples of variables described by lognormal distributions include real estate property values, stock prices, and oil reserves.

III. UNIFORM:

All values have an equal chance of occurring, and the user simply defines the minimum and maximum. Examples of variables that could be uniformly distributed include manufacturing costs or future sales revenues for a new product.

IV. TRIANGULAR:

The user defines the minimum, most likely, and maximum values. Values around the most likely are more likely to occur. Variables that could be described by a triangular distribution include past sales history per unit of time and inventory levels.

V. PERT:

The user defines the minimum, most likely, and maximum values, just like the triangular distribution. Values around the most likely are more likely to occur. However, values between the most likely and extremes are more likely to occur than the triangular; that is, the extremes are not as emphasized. An example of the use of a PERT distribution is to describe the duration of a task in a project management model.

VI. DISCRETE:

The user defines specific values that may occur and the likelihood of each outcome. An example might be the results of a lawsuit: 20% chance of positive verdict, 30% change of negative verdict, 40% chance of settlement, and 10% chance of mistrial. During a Monte Carlo simulation, values are sampled at random from the input probability distributions. Each set of samples is called an iteration, and the resulting outcome from that sample is recorded. Monte Carlo simulations do this hundreds or thousands of times, and the result is a probability distribution of possible outcomes. In this manner, Monte Carlo simulation provides a much more comprehensive view of what may happen. It tells you not only what could happen, but how likely it is in fact to happen.

2. WHY MONTE CARLO SIMULATION IN SHAREPOINT?

2.1. INTRODUCTION

Monte Carlo simulation is commonly used to evaluate the risk and uncertainty that would affect the outcome of different decision options. Monte Carlo simulation allows the business risk analyst to incorporate the total effects of uncertainty in variables like sales volume, commodity and labor prices, interest and exchange rates, as well as the effect of distinct risk events like the cancellation of a contract or the change of a tax law. It is one of the few methods of prediction that have been shown to be statistically significant and has a long history of use in many different fields.

Monte Carlo methods in finance are often used to evaluate investments in projects at a business unit or corporate level, or to evaluate financial derivatives. They can be used to model project schedules, where simulations aggregate estimates for worst-case, best-case, and most likely durations for each task to determine outcomes for the overall project. Monte Carlo methods are also used in option pricing, default risk analysis.

3. MONTE CARLO STAT ADD-IN OVERVIEW

3.1. HOME

I. The Home tab shows the Monte Carlo Stat Add-In description and information related to the Add-In.

Monte Carlo Stat Add-in

Home	Table	Summary	Settings	Import	Request Customization
	C	Mon	te Carlo St the power of h	at App	simulations to Ust Data and gain predictive insights and statistics. Using this add-in, users can identify data-sets
MON	TE CARLO	stored simula and S	in Lists and ru tions on busity tandard Deviat	in hundreds ess critical d ion and grap	of simulations using the well established Mortle Carlo Method to obtain a distribution of likely outcomes. Run data such as sales estimates, production output and project completion. Obtain key statistics such as Mean, Median ph results using Google Charts. Import data from files and lists and export data to the same as well as PDF
		The M statist distrib provid Share Media graph export ensur	onte Carlo Sta Cal method lo the add-in pro- ution of results is the add-in th Point Lists. Ex in and Standar ing Users can table, easy to r ing data privac	It add-in brin predict futur wides a range and a rande e seed data port data din d Deviation select different inderstand a y and securit	Igs the power of Monte Carlo Simulations to SharePoint Lists and Office 365. Monte Carlo simulations are a le results by using random seed numbers and many hundred simulations. Rather than attempting to predict an exact ge of results, similar to a bell curve. Utilizing a proprietary simulation agorithm, the add-in uses the preferred orm seed number generator to run up to 500 simulations per row of data. Users select the columns and rows to i and identify where the output data can be stored. Import data from spreadsheets, CSV files or operate on existing ectly PDF, CSV or spreadsheet applications. Results are delivered by percentile categories and include the Mean, With Google Charts incorporated into the app. It provides the latest in reactive JavaScript based charting and ent distribution models, use currencies and select a custom number of simulations up to 500. Results are fast, and run only on the local user's browser. All data remains within the tenant, user and deployed Site Collection ity.
		For de	rtails, find user	guide at na	tps://zagrosenterprises.com/monte-carlo-stat-app

3.2. SETTINGS

3.2.1. SELECT LIST:

- To run "Monte Carlo Simulation", you have to select a List first on which you want run simulations. You can select any List on the SharePoint Site from Settings tab. Avoid selecting SharePoint Lists or Document Libraries. Configuration Lists, such as MicroFeed, and galleries should not be selected.
- II. Click on Select Lists dropdown box and select list.

Monte Carlo Stat Add-in

Home Table Summary Settings Import Request Customization	
Select List :0	
MVTestCase	
Please select	
MVTestCase_04_05_2019_06.59.43_PM MVTestCase_04_05_2019_07.56.21_PM MVTestCase_04_05_2019_07.56.21_PM	

3.2.2. SELECT LIST COLUMNS:

- I. After selecting a list from the dropdown menu, you must select **Columns** of the selected list on which the **Monte Carlo Algorithm** calculate values.
- II. You must select columns in pairs. E.g. First select **Input Column** which will be used for Monte Carlo algorithm input values. Then Select **Output Column in** which the Add-In will store predicted values calculated by Monte Carlo Simulation based on **Input Column** values.
- III. You can add or remove column pairs according to requirements.

Monte Carlo Stat Add-in

Home Table	Summary Settings Import Request	Customization	
Select List :0			
MVTestCase			*
Input Fields		Output Fields	
Sales	•	SalesForcast	
Profit	*	ProfitForcast -	
Profit	•	ProfitForcast •	
+ Add			
IV Not	۵.		

- a. Users cannot select built-in list columns E.g. (Modified, Created etc.). Built-in columns will not be shown while selecting pairs of columns either.
- Only Number, Currency and Date type columns can be selected and shown while selecting columns. All other data type columns will not be shown in dropdown list E.g. Text etc.
 Simulations cannot be run on these column types and they are hidden as a result.

3.2.3. NUMBER OF ROWS:

I. After selecting list columns pair, the user will have to input number of rows on which Monte Carlo simulation algorithm will work and predict output values. E.g. There are 500 rows in SharePoint list and you enter 10 in "No of Rows" input box then Monte Carlo Stat Add-In will only show, simulate and predict values on the first 10 rows of SharePoint List. Note there is no header row in a SharePoint

No of Rows:0

5

List.

3.2.4. NUMBER OF ITERATIONS:

I. Now you must input the number of iterations in "No of Iteration" input box. This value will define how many times Monte Carlo algorithm will predict a value for a input value. E.g. You enter 10 in No of Iteration input box. And there are 2 input columns, 2 output columns and total 10 rows of both columns. So for one particular value of input column there will be 10 predicted values will be generated. The average of those predicted values will save in the output column for that input. The more iterations or simulations that are run, the slower the processing will be but the more accurate the results will become. Very low values below 10 should be avoided.

No of Iteration: 😡

5

Example:

- No. of Iterations = 10
- Input Column 1 Value = 18
- Predicted Values = 88.277,194.404,196.524,217.382,261.904,275.245,293.843,408.836,419.161,477.387
- There are 10 values generated from Monte Carlo Algorithm. Now we will take average of these values and store it in Output Column 1.
- Output Column 1 Value = 283.296

3.2.5. SELECT DISTRIBUTION TYPE:

- I. Select distribution type from dropdown box. There are two types of Distribution used in Monte Carlo Stat Add-In to predict output values.
 - a. Normal Distribution.
 - b. Triangular Distribution.

Type of Distribution:

Normal Distribution	*
Please select	
Normal Distribution	
Triangular Distribution	

3.2.5.1. NORMAL DISTRIBUTION:

- "Normal" Or "bell curve." The user simply defines the mean or expected value and a standard deviation to describe the variation about the mean. Values in the middle near the mean are most likely to occur. It is symmetric and describes many natural phenomena such as people's heights. Examples of variables described by normal distributions include inflation rates and energy prices.
- II. Normal distribution uses **mean** and **standard deviation** with **random number probability** to calculate a predicted output. We calculate mean and standard deviation of each input column values and generate a random number between 0 to 1 to predict an output result.
- III. For calculations we use the **NORM.INV** function. It will calculate the inverse of the normal cumulative distribution for a supplied value of x, and a given distribution mean and standard deviation. The function will calculate the probability to the left of any point in a normal distribution.
- IV. Formula:

=NORM.INV (probability, mean, standard_dev)

- V. The NORM.INV formula uses the following arguments:
 - a. PROBABILITY:

It is the probability corresponding to a normal distribution. It is the value at which we want to evaluate the inverse function. Probability is chance of any specific event occurring. The two extremes of this are the upper and lower level of probability (i.e. it never happens,

or it will happen). Never happens is 0 as chance and happens is 1 as probability. Hence it lies between 0 and 1.

In the **Monte Carlo Stat Add-In** we are using the **Math.Random()** function. It returns value a between 0 and 1 as discussed before.

- b. MEAN:
 - It is the arithmetic mean. The method of calculating mean is discussed before in 4.2.
- c. STANDARD DEVIATION:

It is the standard deviation of the distribution. The method of calculation standard deviation is discussed before as well in section 4.3.

3.2.5.2. TRIANGULAR DISTRIBUTION:

- I. The user defines the minimum, most likely, and maximum values. Values around the most likely are more likely to occur. Variables that could be described by a triangular distribution include past sales history per unit of time and inventory levels.
- II. A triangular distribution is a continuous probability distribution with a probability density function shaped like a triangle. It is defined by three values: the minimum value a, the maximum value b, and the peak value c.
- III. The triangular distribution has a definite upper and lower limit, so as to avoid unwanted extreme values. In addition, the triangular distribution is a good model for skewed distributions. The sum of two dice is often modelled as a discrete triangular distribution with a minimum of 2, a maximum of 12 and a peak at 7.
- IV. Formula:

=TRI.INV (probability, min, max, mode)

- V. The TRI.INV formula uses the following arguments:
 - a. PROBABILITY:

It is the probability corresponding to normal distribution. It is the value at which we want to evaluate the inverse function. Probability is chance of happening of something. The two extremes of this i.e. upper and lower level of this is it never happens, or it happens. Never happens is 0 as chance and happens is 1 as chance. Hence it lies between 0 and 1. In **Monte Carlo Stat Add-In** we are using **Math.Random()** function. It returns value between 0 and 1 as discussed before.

b. MIN:

The minimum value of Input Column.

c. MAX:

The maximum value of Input Column.

d. MODE:

The most recurring value of Input Column. Or Mean in case of non-recurring values.

3.2.6. GENERATE SIMULATION LOG FILE:

I. The purpose of the Generate Simulation Log File flag is to generate and download the detail of each Monte Carlo Algorithm simulation. Users can see how the predicted value is generated and view all of the random simulation values generated. If this flag is checked then after each simulation run, a log text file will be downloaded in the default download directory of the browser. This log file is also a valuable tool for technical support.

3.2.7. SAVE

- I. Press the **"Save"** button to save settings.
- II. After saving the setting, the Add-In will refresh automatically and will show data according to new settings.

3.3. TABLE

3.3.1. TABLE AND SIMULATION

I. After saving the settings, the Add-In will redirect to the **Table** tab to display input and output column values in a responsive grid form. You will see your selected input and output columns in the **Table** tab with the **Title** column.

Monte Carlo Stat Add-in

Home Table	Summary Settings Imp	ort Request Customization			
Selected List	t : MVTestCase			Start S	inutation
Title	* Sales	 Sales Forcast 	· Profit	 Profit Forcast 	
Cakes	\$2,000.00	\$14,344.25	\$200.00	\$446.34	
Juices	\$10,000.00	\$17,741,65	\$300.00	\$530 14	
Sweets	\$40,000.00	\$17,117.09	\$400.00	\$462.55	
4					

II. Press Start Simulation button to run Monte Carlo Simulation.

Monte Carlo Stat Add-In

Home	Summary Settings Imp	ort Request Customization		
Selected List	: MVTestCase			🗘 Saradattag
TIDE	Sales	 Sales Forcest 	* Profit	🗧 Profil Forcast 🛛 👻
Cales	\$3,006.00	\$14,344.25	\$200.00	\$448.94
Juces	\$10,000-00	\$17,741.65	\$300.00	\$530.14
Sweets	\$40,000.00	\$17,117,09	\$400.00	\$402.65
		0		

III. After pressing the **Start Simulation** button, the Monte Carlo algorithm will start calculating predicted values for each **Input Column** and will store predicted value in **Output Column**.

Home Tabl	le Summa	ry Settings	Import	Request Customiz	ation			
Success : Sin	nulation Run St	ICCESSAII.						
Selected L	ist : MVTes	tCase						Start Simulation
Selected L	ist : MVTes	tCase Sales	×	Sales Forcast	🐣 Sales Forcast Min		Sales Forcast Max	Start Simulati
Selected L Title Cakos	ist : MVTes	tCase Sales \$2,000.00	×	Sales Forcast \$31.792.90	 Sales Forcast Min \$10789.323 	*	Sales Forcast Max \$48505,224	Start Simulate
Selected L Title Cakes Juices	ist : MVTes	tCase Sales \$2:000.00 \$10,000.00	×	Sales Forcast \$31,792 90 \$46,578 50	 Sales Forcast Min \$10769.323 \$19764.914 	1	Sales Forcast Max 548555 224 \$71631 699	Start Simulativ Sales For \$12728.2 \$41166.3

- IV. After the Simulation run is successful, you will see a Success message on top of table.
- V. You will notice that before running simulations there were only five columns in the table. Title, Input Column 1, Output Column 1, Input Column 2 and Output Column 2. But after, there are an additional four columns added in the table with each column pair.
- VI. User's may sort and hide columns based on their preferences
- VII. The Output Column's value is the average of the predicted values. As discussed in No of Iteration point. (3.2.4).
- VIII. Additional columns include the Min value, Max value, 25th Percentile and 75th Percentile from predicted values that generated for that particular input to predict output value.
 Example:
 - No. of Iterations = 10
 - Input Value = 18
 - 10 Predicted Values:
 [138.707,146.566,161.832,165.606,206.273,212.853,232.4,273.079,289.962,487.702]
 - Output Value = 231.498 (Average)
 - Min Value = 138.707
 - Max Value = 487.702
 - Percentile: The percentile indicates that a certain percentage falls below that percentile. For example, if you score in the 25th percentile, then 25% of test takers are below your score. The "25" is called the percentile rank.
 - a. Finding the 25th Percentile:
 - b. Input: [138.707,146.566,161.832,165.606,206.273,212.853,232.4,273.079,289.962,487.702]
 - Step 1: Arrange the data in ascending order: 138.707, 146.566, 161.832, 165.606, 206.273, 212.853, 232.4, 273.079, 289.962, 487.702
 - d. Step 2: Compute the position of the pth percentile (index i):
 - i = (p / 100) * n), where p = 25 and n = 10 i = (25 / 100) * 10 = 2.5
 - e. **Step 3**: The index i is not an integer, round up. (i = 3) \Rightarrow the 25th percentile is the value in 3th position, or 161.832
 - f. Answer: the 25th percentile is 161.832

- g. There may be a minor difference in decimal values between the Monte Carlo Stat Add-In percentiles versus manually calculated percentiles due to the very precise algorithm used in the Add-In. These minor differences are inconsequential.
- h. Ref: https://goodcalculators.com/percentile-calculator/

3.3.2. TABLE EXPORT

- I. The Table Export feature is used to export and store results for reporting, reference or future usage. Several formats are available.
 - a. Excel. (An .XLSX file will be downloaded into the default download directory.).
 - b. CSV. (A .CSV (Comma Separate Value) file will be downloaded into the default download directory.PDF. (A .PDF file will be downloaded into the default download directory.
 - c. SharePoint List. (A new SharePoint list will be created in the site with a default new name and exported data). A hyperlink to this list will be provided in the view and the list will automatically be stored on the same site where the Add-In is currently running.
- II. There are two types of exports of data.
 - a. All Data.
 - Export All Data regardless that the user may hide any column from the table view.
 - b. Visible Data.
 - Export *only* visible data of the table view. If the user hides any column from the table then its data will *not be exported*.
 - c. Special Case (Export to SharePoint List).
 - In the Export to SharePoint List, all data will *always* be exported to the new SharePoint List, regardless of hidden columns. The new SharePoint List name will be displayed and linked too in the success message after a successful export procedure.

Monte Carlo Stat Add-In

Home Table	summary	settings	import	Request Customiz	abon					
Success : Expr	off to List Succes	ssful. New List Na	ime: MVTest	Case_20_05_2019_09	40.20_P	м				
									1000	
Selected Li	st : MVTestC	ase ales		Sales Forcast		Sales Forcast Min		Sales Forcast Max	St	art Simulation Sales Force
Selected Lit te akes	st : MVTestC	ase ales 2.000.00	×.	Sales Forcast \$36,966,25	S.	Sales Forcast Min \$642.934		Sales Forcast Max 967622:335	St.	Sales Force \$24132.613
Selected Li lee akes akes	st : MVTestO	ase 9005 2.000.00 10.000.00	ž	Sales Forcast \$36,966,25 \$26,563,34	٢	Sales Forcast Min \$842.934 \$3879.856	*	Sales Forcast Max 967622:335 963965:057	, St	art Simulation Sales Force \$24132.613 \$9766.494

3.4. SUMMARY

- I. There is a **Summary** tab to view a summary of **Input Column** values. The Summary view includes the Mean, Median, Standard Deviation, Min, Max and Mode of input columns values. It is suitable for a quick overview of all essential information.
- II. Values used in the Monte Carlo Simulations to predict **Output Column** values are displayed

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12122112				C 1 L 1		- I I I I I I I I I I I I I I I I I I I	

Home 1	Table <mark>Su</mark>	ammary Se	ittings Import	Request Customization			
elected I	List : MVT	estCase					
Field Name	r.	Mean	Median	Standard Deviation	Min	Max	Mode
Sales		17333.333	10000.000	16357.126	2000.000	40000.000	2000.000

- III. The graphing and charting feature allows users to interpret the overall trend and location of simulation results.
 - a. For Normal Distribution:



b. For Triangular Distribution:



Triangular distribution experiment

3.5. DATA IMPORT

- I. Users may opt to import data into a SharePoint List from Excel using the Monte Carlo Stat Add-In.
- II. Select an Excel File¹ from your Local Directory.
 - Select File.* Choose Files MVTestCase xisx

III. Preview the Uploaded file in Grid format prior to import.

File Preview:

Title	~ Protit	~ Profit Forcast	
Cakes	\$200.00	\$371.98	
Juices	\$300.00	\$361.90	
Sweets	\$400.00	\$370.68	

٠

IV. Select Import to List Type:

a. New List	a.	New	List
-------------	----	-----	------

Import As:" New List * Select From List ©

Enter List Name:

New List

b. Existing List:

Import As:" New List D Select From List

-	-	-	+ 1	1.	- 1	
۲	*	**	• •	-		0

MVTestCase_04_05_2019_06.59.43_PM

V. Press "**Upload**" to import the file.

- VI. **Note:** To import the file to an existing List successfully, users must insure following thing in excel file:
 - a. Number of Columns must be the same both in Excel and the SharePoint selected list.
 - b. Sequence of Columns must be same both in Excel file and the SharePoint selected list.
 - c. Display name or header name in the Excel file must be the same as in the SharePoint selected list.
 - d. Only integer and decimal type data can be imported into a list at this time.
 - e. The Excel file must contain a text Title column as first column. And it is case sensitive.

On Successful import, a Success message will be displayed on top of the Import Tab.

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						2631		14.2	-	
		·		41.1		10 N I				

lome	Table	Summary	Settings	Import	Request Custor	mization		
Success	: Excel imp	ion Successiv	it. New List N	ame New Lit	1_20_05_2019_09.5	54.28_PM		
Import	Instruct	ions:						
Step 1: 5 Step 2: P	elect Excel review sele	File from you cled File in G	r Local Direct	ory.				
Step 3: S	elect List 7	ypė. €.g. linpa	ort Excel File	data to New I	ist or in Existing Lis	t and a second second		
Step 41 D Step 5: P	ased on se ress "UPLC	section on ste DAD" button I	p 3, cmer Ne lo start imbort	w List name i Ing data	ar select Exerting Lit	st from gropdown		
Note: TE	and File m	of Dian This	" rolarm las	Test column c	100			

¹ Microsoft Excel is not required per se but the file must be in the correct format. No size limitation exists but files under 2MB are recommended. The file should also be simplified prior to import to contain only data.

3.6. REQUEST CUSTOMIZATION:

I. Please fill out the Customization Request form if you need any customization or have comments and feedback. We will contact you in a short period of time. Also, you can contact us through request customization form if you are facing any errors in the Monte Carlo Stat Add-In.

		-	- 4-						
ome	Table	Summary	Settings	Import	Request Cu	stomization			
Real	iest Cus	tomizat	tion						
iend yo	ur message i	the form be	low and we wi	l get back to	you as early as	possible.			
Inci Na	-								
act Na	me:*								
mall:•									
hone:									
organiz	ation:*								
leques	t•						 	 	
esorip	tion:*								
Your N	lessage Here								

4. MONTE CARLO ALGORITHM

4.1. INTRODUCTION

The Monte Carlo Stat Add-In, heavily depends on calculations that generate Mean, Median, Standard Deviation, Min, Max, Mode and log inverse.

Suppose input columns have 3 values:

Index	Values
1	50000
2	500
3	70000

4.2. MEAN:

The mean is the average of the numbers. Simply: add up all the numbers, then divide by how many numbers there are.

So, it will be: (50000+500+ 70000)/3 = 40166.667

4.3. MEDIAN

To find the median number:

- i. Put all the numbers in numerical order.
- ii. If there is an odd number of values, then median is the middle value.
- iii. If there is even number of values, then median will be mean of two middle values.
- iv. So median will be = 50000.
- v. Suppose there are 4 values, 50000, 1000,700,70000 then median will be = (1000+50000)/2 = 255000.

4.4. STANDARD DEVIATION

To calculate the standard deviation of those numbers:

- i. Work out the Mean (the simple average of the numbers)
- ii. Then for each number: subtract the Mean and square the result.
- iii. Then work out the mean of those squared differences.
- iv. Take the square root of that.
- v. This is the formula for Standard Deviation:

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (x_i - \mu)^2}$$

vi. So, means will be: (50000+500+ 70000)/3 = 40166.667

vii. Standard Deviation = Sq root (($(50000-40166.667)^2 + (500-40166.667)^2 + (70000-40166.667)^2$)/3 = Sq root ((96694437.889 + 1573444470.889 + 890027757.889)/3) = Sq root(2560166666.667/3) = 29212.821

4.5. MIN

To find Min value:

- i. Min is the minimum value from input values.
- ii. So, Min will be = 500.

4.6. MAX

To find Min value:

- i. Max is the maximum value from input values.
- ii. So, Max will be = 70000.

4.7. MODE

To find Mode value:

- i. Mode is the most recurring value from input values.
- ii. Suppose there are recurring input values, 5000, 1000, 50000, 70000.
- iii. So, Mode will be = 1000.
- iv. If there are non-recurring input values, then we are considering media value as mode value.
- v. So, Mode will be = 50000.

4.5. MONTE CARLO CALCULATION

4.5.1. NORMAL DISTRIBUTION:

Monte Carlo Simulation is used in various applications to predict or analyze data on the basis of prior knowledge. There are various techniques in which we can integrate Monte Carlo algorithm according to specific requirements. In Monte Carlo Stat Add-In we are using the well accepted **Normal Inverse Gaussian** technique to predict output values based on input values. It is *not* intended to predict the *exact* outcome, but instead to provide a range of likely values based on repeated simulations. These estimated values and ranges are highly beneficial in a wide array of tasks and fields across many industries.

Normal Inverse Gaussian uses **mean** and **standard deviation** with **random number probability** to calculate predicted output. We calculate the mean and standard deviation of each input column value and generate a random number between 0 to 1 to predict the output result.

For calculations and simulations, we are using the **NORM.INV** function. It will calculate the inverse of the normal cumulative distribution for a supplied value of **x**, and a given distribution mean and standard deviation. The function will calculate the probability to the left of any point in a normal distribution. Formula:

=NORM.INV(probability,mean,standard_dev)

Returns the value of probability in the inverse cdf for the Normal distribution with parameters mean and std (standard deviation).

The NORM.INV formula uses the following arguments:

• PROBABILITY:

It is the probability corresponding to normal distribution. It is the value at which we want to evaluate the inverse function. Probability is chance of happening of something. The two extremes of this i.e. upper and lower level of this is it never happens, or it definitely happens. Never happens is 0 as chance and definitely happens is 1 as chance. Hence it lies between 0 and 1.

In **Monte Carlo Stat Add-In** we are using **Math.Random()** function. It returns value between 0 and 1 as discussed before.

• MEAN:

It is the arithmetic mean of distribution. The method of calculating mean is discussed before in 4.2.

• STANDARD DEVIATION:

It is the standard deviation of the distribution. The method of calculation standard deviation is discussed before as well in section 4.3.

4.5.1.1. EXAMPLE AND VERIFICATION

To find normal inverse:

- I. Take input values.
 - i. 50000
 - ii. 500
 - iii. 70000
- II. Calculate Mean of given input values as discussed before. The mean of given input is 40166.667
- III. Calculate Standard Deviation of given input values. Standard Deviation is 29212.821
- IV. Now find any random number from 0 to 1 as a probability. We are using Math.Random() function to generate random numbers. For instance, we assume random number 0.2.
- V. Now we have all three parameters for normal inverse function.
 - i. Mean=40166.667
 - ii. Standard Deviation=29212.821
 - iii. Probability=0.2 (Random Number)
- VI. As we discussed earlier, we are using the normal inverse distribution technique, which is based on a normal distribution curve.

Pass these values to normal inverse function and it will return the value of left tail of Gaussian curve. For any normal distribution, the left-tail probability is the area under the curve to the left of some specific value divided by the total area under the curve. For the standard normal distribution, the total area under the curve is exactly 1. Consequently, the left-tail probability, P(z < c), is just the area under the curve and to the left of c. This area is integral to the standard normal distribution function

from negative infinity to c:



- VII.
 The result form the Normal Inverse function is 15580.5. For result verification we are using a well-known online statistical calculator to compare results.

 Link:
 http://www.wolframalpha.com/widgets/view.jsp?id=540d8e149b5e7de92553fdd7b1093f6d
- VIII. To verify result in Excel. There is also NORM.INV() function in Excel. Pass probability, mean and standard deviation to this function and it will return left tail value of Gaussian distribution curve. Link: https://corporatefinanceinstitute.com/resources/excel/functions/norm-inv-function/

Results:

Input information:			
probabilities for th	ne normal distribution		
probability	0.2		
mean	40 166.7		
standard deviation	1 29212.8		
x-values:			
left-tail	P(z < 15580.5) = 0.2		1
right-tail	P(z>64752.8)=0.2		1
two-tail	$P(z - \frac{2760232338469}{6871947673})$	$\left \frac{159}{6} \right > 37437.7) = 0.2$	
confidence level	$P(z - \frac{2760232338469}{6871947673})$	$\left \frac{159}{6} \right < 7400.98) = 0.2$	
Plot:			8000t 11
$\begin{array}{c} 0.000014\\ 0.000012\\ 0.000010\\ 8.\times10^{-6}\\ 6.\times10^{-6}\\ 4.\times10^{-6}\\ 2.\times10^{-6}\\ 0.000000\end{array}$	50000 100000		<u>ent????tail</u> ▼

4.5.2. TRIANGULAR DISTRIBUTION:

- I. The user defines the minimum, most likely, and maximum values. Values around the most likely are more likely to occur. Variables that could be described by a triangular distribution include past sales history per unit of time and inventory levels.
- II. A triangular distribution is a continuous probability distribution with a probability density function shaped like a triangle. It is defined by three values: the minimum value a, the maximum value b, and the peak value c.
- III. The triangular distribution has a definite upper and lower limit, so we avoid unwanted extreme values. In addition, the triangular distribution is a good model for skewed distributions. The sum of two dice is often modelled as a discrete triangular distribution with a minimum of 2, a maximum of 12 and a peak at 7.
- IV. Formula:

=TRI.INV (probability,min, max, mode)

Returns the value of probability in the inverse cdf for the Triangular distribution with parameters min, max and mode.

- V. The TRI.INV formula uses the following arguments:
 - e. PROBABILITY:

It is the probability corresponding to normal distribution. It is the value at which we want to evaluate the inverse function. Probability is chance of happening of something. The two extremes of this i.e. upper and lower level of this is it never happens, or it happens. Never happens is 0 as chance and happens is 1 as chance. Hence it lies between 0 and 1. In **Monte Carlo Stat Add-In** we are using **Math.Random()** function. It returns value between 0 and 1 as discussed before.

f. MIN:

The minimum value of Input Column.

g. MAX:

The maximum value of Input Column.

h. MODE:

The most recurring value of Input Column. Or Mean in case of non-recurring values.

4.5.2.1. EXAMPLE AND VERIFICATION:

To find normal inverse:

- I. Take input values.
 - i. 50000
 - ii. 500
 - iii. 70000
- II. Calculate Min of given input values as discussed before. The Min of given input is 500.
- III. Calculate Max of given input values as discussed before. The Max of given input is 70000.
- IV. Calculate Mode of given input values. As there are non-recurring values, we will use Median as Mode. That is 50000.
- V. Now find any random number from 0 to 1 as a probability. We are using Math.Random() function to generate random number. For instance, we assume random number 0.2.
- VI. Now we have all four parameters for normal inverse function.

- i. Min=500.
- ii. Max=70000.
- iii. Mode = 50000.
- iv. Probability = 0.2 (Random Number)
- VII. All probability density functions have the property that the area under the function is 1. For the triangular distribution this property implies that the maximum value of the probability distribution function is 2/(b-a). It occurs at the peak value of c. The probability density function of a triangular distribution is zero for values below a and values above b. It is piecewise linear rising from 0 at a to 2/(b-1) at c, then dropping down to 0 at b. The graph below shows the probability density function of a triangle distribution with a=1, b=9 and c=6. The peak is at c=6 with a function value of 0.25.



VIII. The formula for the probability density function is:Given a random variate U drawn from the uniform distribution in the interval (0, 1), then the variate:

$$X = \begin{cases} a + \sqrt{U(b-a)(c-a)} & \text{for } 0 < U < F(c) \end{cases}$$

$$b - \sqrt{(1-U)(b-a)(b-c)} & \text{for } F(c) \le U < 1 \end{cases}$$
[2]

where F(c)=(c-a)/(b-a), has a triangular distribution with parameters *a*,*b* and *c*. This can be obtained from the cumulative distribution function,

IX. In our example:

i. U=0.2

- ii. a=1000 (Min)
- iii. b=70000 (Max)
- iv. c=50000 (Mode)
- v. F(c)=(c-a)/(b-a)=0.7101

So base on condition, O<U<F(c)

- X = 1000 + SQRT (0.2 (70000 -1000) * (50000 1000))
 - = 1000 + SQRT (3381000000)
 - = 1000 + 26003.8458
 - = 27003.8458
- X. To verify result, you have to make this formula in excel sheet and match the results. Ref: <u>https://en.wikipedia.org/wiki/Triangular_distribution</u>
- XI.
 Sample Excel file with default formula. Change Random number generation logic to verify result.

 Ref:
 <u>http://faculty.citadel.edu/betterton/BADM731/Triangular-Distribution.xls</u>

5. DATE/TIME DATA TYPE:

5.1. DETAIL:

- I. There is special user case in Monte Carlo Stat Add-In to handle the **Date/Time** datatype. This is useful for estimating task end dates
- II. Date/Time type data type is very complex to handle. For the Date/Time data type the Add-In has to convert date to a Integer or Float to calculate parameters for distribution functions.
- III. It is easy to calculate mean and standard deviation of Integer and Float types. There are several methods available in JavaScript that can calculate these values for Integer and Float. However, there is no method available which can find out mean and standard deviation for Date/Time type.

5.2. SOLUTION:

- I. First step to calculate mean and standard deviation of Date/Time type column is to sort the Date/Time type column in ascending order. (Oldest date to Latest Date).
- II. Then we find out difference of each date from oldest date. From this we get days value as Integer.
- III. Now save days values in temporary buffer.
- IV. Find out Mean from days temporary buffer as we find mean for Integer type.
- V. Find out Standard Deviation from days temporary buffer.
- VI. Find out Min days value.
- VII. Find out Max days value.
- VIII. Find out Median value.
- IX. Now we have all required parameters for both Normal and Triangular distribution.
- X. Generate Random variable and according to distribution type, pass required parameters to distribution function to get predicted value.
- XI. But problem is that predicted value again in Integer or in Float type. The predicted value is in days form. But what we need is a predicted Date/Time value.
- XII. For this we are using **Moment.js** library, Moment.js is used to add days in particular date to generate new date.
- XIII. Now we have predicted value as days, and Input value for which predicted days have been calculated. By using Moment, we just simply added predicted days in input date and find out output value for that particular input value.
- XIV. This is how Monte Carlo algorithm working for Date/Time type.

5.3. EXAMPLE:

- I. Suppose we have three Date/Time values: 2018-11-09, 2018-11-02, 2018-11-14
- II. Sort ascendingly: 2018-11-02, 2018-11-09, 2018-11-14.
- III. Calculate difference (Days) = 2018-11-09 2018-11-02 = 7 and 2018-11-14 2018-11-02 = 12.
- IV. Calculate Mean = 9.500.
- V. Calculate Median = 9.500.
- VI. Calculate Standard Deviation = 2.500
- VII. Calculate Min = 7.00, Max = 12.00 and Mode = 7.00.
- VIII. Now predict value for input = 2018-11-14.
- IX. Random Numbers = [0.742,0.792,5.082,9.811,10.87,11.307,14.595,16.591,29.065,36.313]

- X. Average Values (Mean)= 13.5168
- XI. Median = 11.0885
- XII. Min = 0.742
- XIII. Max = 36.313
- XIV. Standard Deviation = 10.92
- XV. So now we just add these values as days in Input Date/Time to calculate output values.
- XVI. Output Value = 2018-11-14 + Ceil (13.5168(days)) = 2018-11-28
- XVII. Date Time Output Average: 2018-11-14 + Ceil (13.5168(days)) = 2018-11-28
- XVIII. Date Time Output Min: 2018-11-14 + Ceil (0.742(days)) = 2018-11-15
- XIX. Date Time Output Max: 2018-11-14 + Ceil (36.313(days)) = 2018-12-21

Monte Carlo Stat Add-in

Home Table	Summary	Settings	Import	Request Customiz	ation				
Selected Lit	st : MVTestCa	150						St	art Simulation
Title	× D	ne Input	×	Date Output	19	Date Output Min	 Date Output Max		Date Outpu
Cakes	20	18-11-09		2018-11-26		2018-11-13	2018-12-10		2018-11-18
Juices	20	18-11-02		2018-11-13		2018-11-03	2018-12-02		2018-11-05
Sweets	20	18-11-14		2018-11-28		2018-11-15	2018-12-21		2018-11-21

6. BROWSER COMPATIBILITY AND SUPPORT

The Monte Carlo Add-In uses advanced features that don't necessarily work with all web browsers. Outlined below are the supported browsers and versions. To request additional support, please use the Request Customization form.

IE (<=10)	Not Supported
IE 11	Supported
Google Chrome	Supported
Firefox	Supported
Edge	Supported

7. TEST ADD-IN

Contoso Inc, a sales and marketing company needs sales forecasting.

7.1. STEP 1 - CREATE LIST

- 1. Click Settings and then click Site contents.
- 2. Click + **New**, and then click **List**.

✓ Search	$+$ New \sim
Home Documents Marketing documents	List Page Document library
Site contents	Арр
Events to Staff	Subsite

Type a Name "Sales Forecast" for the list, and optionally, type a Description.
 The name "Sales Forecast" will appear at the top of the list and can show in site navigation to help others find it.

	\times
Create list	
Name *	
Sales Forecast	
Description	
List for forecasting sales of <u>Contoso</u> Inc.	
✓ Show in site navigation	
Create Cancel	

4. Click Create.

5. When your list opens, you can click + or + Add column to add room for more types of information to the list.



Name field. Note: Remember "Q1" is an input column for Monte Carlo Stat Add-In. It should store input values for Monte Carlo Stat Add-In.

	- //
Туре	
Currency	\sim
Number of decimal places	
Automatic	\sim
Currency format	
\$123,456.00 (United States)	\sim
Default value	
Enter a number	
Save Cancel	
Save Cancel	

9. Click Save.

- Repeat from Step 6, and In the Create a column panel, type "Q1Forcast" or "Quarter1Forcast" into the Name field. Note: Remember "Q1Forcast" is an output column for Monte Carlo Stat Add-In. It will store forecasted value base on "Q1" column values after running Monte Carlo Algorithm on Q1 column values.
- 11. Click Save.

Create a column

Learn more about column creation.

Name *

 Q1Forecast

 Description

 Quarter 1 Forecast

 Type

 Currency

 Number of decimal places

 Automatic

 Currency format

 \$123,456,00 (United States)

 Default value

 Enter a number

Cancel

Save

- 12. Repeat from Step 6 to create columns:
 - I. Q2.
 - II. Q2Forecast.
 - III. Q3.
 - IV. Q3Forecast.
 - V. Q4.

VI. Q4Forecast.

+ New 🖉 Quick edit 🕼 Exp	port to Excel w ^e Flow	v 🎨 PowerApp:	(W) (H)				⇒ All n	ems* 🗸 🖓 🕕
Sales Forecast								
Title \lor	Q1 \(Q1Porecest ~	qz 🖂	Q2Forecast ~	q3 ~	Q3Porecast ~ Q	4	+ Add column
				- 22				
			-=					
				- 197				

- Now list and columns have been created. To insert data, Click +New button from top bar.
- 14. In New item panel, Type following details:
 - I. Title: 2019
 - II. **Q1**: 2000
 - III. Q1Forecast: (left blank).
 - IV. **Q2**: 2500
 - V. **Q2Forecast**: (left blank).
 - VI. **Q3**: 1500
 - VII. **Q3Forecast**: (left blank).
 - VIII. **Q4**: 5000
 - IX. Q4Forecast: (left blank).

Note: Columns Q1Forecast, Q1Forecast, Q1Forecast and Q1Forecast will update automatically after running Monte Carlo Stat Add-In algorithm on Q1, Q2, Q3 and Q4 columns.

15. Click Save.

New item		
Title *		
2019		
Q1		
2000		
Quarter 1		
Q1Forecast		
Enter a number		
Quarter 1 Forecast		
Q2		
2500		
Quarter 2		
Q2Forecast		
Enter a number		
Quarter 2 Forecast		
Q3		
1500		
Quarter 3		
Q3Forecast		
Enter a number		
Quarter 3 Forecast		
Q4		
5000		
Quarter 4		
Q4Forecast		
Enter a number		
Quarter 4 Forecast		

10. Repeat non Step 15 to insert following values in its	16.	Repeat from	Step 13 to	insert following	values in list
---	-----	-------------	------------	------------------	----------------

Year	Q1	Q2	Q3	Q4
2019	2000	2500	1500	5000
2018	3000	4000	2000	1500
2017	2500	1500	4000	3000
2016	1500	2500	1000	2000
2015	2000	1000	1500	2500

+ New 🖉 Quick edit 🕼	Export to Excel is " Fic	ow 😒 🗆 🕸 PowerA	pps 😔 \cdots				⇒ All Items*	× 7 0
Sales Forecast								
Title ~	Q1 ~	Q1Forecast \vee	Q2 ~~	Q2Forecast ~	03 ~	Q3Forecast >>	Q4 ~	G4Forecast
2019	\$2,000.00		\$2,500.00		\$1,500.00		\$5,000.00	
2018	\$3,000,00		\$4,000.00		\$2,000.00		\$1,595.00	
2017	\$2,500.00		\$1,500.00		54,000.00		\$3,000.00	
2016	\$1,500.00		\$2,300.00		\$1,000.00		\$7,000.00	
2015	\$2,000.00		\$1,000.00		\$1,500.00		\$2,500.00	

17. Now everything is setup for Monte Carlo Stat Add-In.

7.2. STEP 2 - MONTE CARLO STAT ADD-IN CONFIGURATION

- 1. Go to Settings tab and configure following settings.
 - I. Select "Sales Forecast" list from Select List dropdown.
 - II. Select **Q1**, **Q2**, **Q3** and **Q4** in input fields dropdown.
 - III. Select Q1Forecast, Q2Forecast, Q3Forecast and Q4Forecast from Output Fields dropdown.
 - IV. Type **5** into **No of Rows** input field.
 - V. Type **5** into **No of Iterations** input field.
 - VI. Select Normal Distribution from Type of Distribution dropdown.

VII. Clic	k Save.
-----------	---------

Home	Table	Summary	Settings	Import	Request	Customization	
Select Lis	st :0						
Sales F	orecast						۳
Input Fie	elds					Output Fields	
Q1					•	Q1Forecast	
Q2					Ŧ	Q2Forecast	
Q3					•	Q3Forecast	
Q4					Ŧ	Q4Forecast	
+ Add							
No of Rov	vs:0						
5							
No of Iter	ation: 😧						
5							
Type of D	istribution	:0					
Normal	Distribution	1					۳
Generate	Simulation	n Log File? 🛛 🌘	•				
H Save						• Hel	p

7.3. STEP 3 - RUN SIMULATION

1. After Save, Monte Carlo Stat Add-In will redirect to Table tab. In the table tab, you will see inserted list values in Title, Q1, Q2, Q3 and Q4 columns. And Q1Forecast, Q2Forecast, Q3Forecast and Q4Forecast

column will be blank. This is because we haven't run Monte Carlo Algorithm Simulation yet.

Monte Carlo Stat Add-in

Home	Table Summ	ary	Settings	Impo	ort Re	quest C	ustomization									
Selecte	ed List : Sales	Forec	ast												Start Simulatio	m
Title	⊻ Q1	~	Q1 Forecast	~	Q2	~	Q2 Forecast	~	Q3	~	Q3 Forecast	×	Q4	~	Q4 Forecast~	Ξ
2019	\$2,000.00				\$2,500.00				\$1,500.00				\$5,000.00			-
2018	\$3,000.00				\$4,000.00				\$2,000.00				\$1,500.00			
2017	\$2,500.00				\$1,500.00				\$4,000.00				\$3,000.00			
2016	\$1,500.00				\$2,500.00				\$1,000.00				\$2,000.00			
2015	\$2,000.00				\$1,000.00				\$1,500.00				\$2,500.00			

- 2. Click Start Simulation.
- After the Simulation is complete, you will see values in Q1Forecast, Q2Forecast, Q3Forecast and Q4Forecast and additional fields for each output columns (Q1Forecast, Q2Forecast, Q3Forecast and Q4Forecast)...

Home Table	Summary	Settings	Import	Request Customizat	ion		
Success : Sim	ulation Run Succ	essful.					
Selected Li	st : Sales Fo	recast	~	Q1 Forecast	Y Q1 Forecast Min	✓ Q1 Forecast Max	Start Simulati
Selected Li Title 2019	st:Sales Fo	recast 1 2,000.00	~	Q1 Forecast \$1,661.73	 Q1 Forecast Min \$1300.391 	 Q1 Forecast Max \$2378.722 	Start Simulati V Q1 Fored \$1358.71
Selected Li: Title 2019 2018	st : Sales Fo	recast 2,000.00 3,000.00	v	Q1 Forecast \$1,661.73 \$2,800.67	 Q1 Forecast Min \$1300.391 \$169.306 	 Q1 Forecast Max \$2378.722 \$6110.410 	Start Simulation • Q1 Forect \$1358.71 \$1363.44
Selected Li: Title 2019 2018 2017	st : Sales Fo	recast 2,000.00 3,000.00 2,500.00	v	Q1 Forecast \$1,661.73 \$2,800.67 \$4,353.45	 Q1 Forecast Min \$1300.391 \$169.306 \$1648.963 	 Q1 Forecast Max \$2378.722 \$6110.410 \$8286.094 	Start Simulation Q1 Forect \$1358.71 \$1363.44 \$3701.64
Selected Li Title 2019 2018 2017 2016	st : Sales Fo	recast 1 2,000.00 3,000.00 2,500.00 1,500.00	~	Q1 Forecast \$1,661.73 \$2,800.67 \$4,353.45 \$2,313.12	 ✓ Q1 Forecast Min S1300.391 S169.306 S1648.963 S138.807 	 Q1 Forecast Max \$2378.722 \$6110.410 \$8286.094 \$5757.568 	Start Simulat V Q1 Forect \$1358.71 \$1363.44 \$3701.64 \$3701.64 \$1565.45 \$1565.45

4. These additional columns show the **Minimum**, **Maximum**, **25**th **Quartile and 75**th **Quartile** value of each predicted output field value generated during Monte Carlo Algorithm Simulation.

The value in output columns (**Q1Forecast, Q2Forecast, Q3Forecast and Q4Forecast**) will be inserted in **Sales Forecast** list automatically. So that the next time when you load or refresh **Monte Carlo Stat Add-In**, these output values will be displayed in respective columns rather than empty columns.

However, additional columns (**Minimum, Maximum, 25th Quartile and 75th Quartile**) values will not be saved or stored anywhere unless user export these into new list. Otherwise on reload of Add-In these columns will disappear and will display only after **Simulation** run.

- 5. You can export current values and status of list as Excel, PDF, CSV and to New SharePoint List.
 - Monte Carlo Stat Add-In

\$1300.391 \$2376.722 \$1395.711 \$1792.473 Export all data as cave \$169.306 \$6110.410 \$1363.448 \$3387.713 Export visible data as cave \$1648.963 \$6296.094 \$3701.643 \$4071.027 Export visible data as cave \$138.007 \$5757.568 \$1595.450 \$2144.826 Export visible data as cave \$417.007 \$5705.063 \$1714.300 \$4207.478 Export visible data as cave	Q1 Forecast Min	Q1 Forecast Max	8 (N	Q1 Forecast 25th Quartile 2.	Q1 Forecast 75th Quartil	= X. 02
\$169.308 \$6110.410 \$1363.448 \$3367.713 Export visible data as of \$1648.963 \$5260.094 \$3701.643 \$4071.027 \$1368.007 \$5757.568 \$1595.450 \$2144.826 Export visible data as of \$417.007 Export visible data as of \$427.007 Export visible data as of \$427.007 Export visible data as of \$427.007	\$1300.391	\$2378.722		51355 711	\$1792.473	Export all data as csv
\$1648.963 \$3226.094 \$3701.643 \$4071.027 Export all data as pdf \$136.807 \$5757.568 \$1595.450 \$2144.826 Export visible data as pdf \$417.007 \$5705.083 \$1714.309 \$4297.478 Export visible data as pdf	\$169.306	56110 410		\$1363.448	\$3367.713	Export visible data as cs
\$138.807 \$5757.568 \$1565.450 \$2144.826 Export visible data as p	\$1648,963	\$8286.094	6	\$3701.643	\$4071.027	Export all data as pdf
\$417.007 \$5705.083 \$1714.309 \$4297.478 Export visible data as p	\$138.807	\$\$757.568		\$1565.450	52144.826	
	\$417.097	\$5705.083		\$1714.309	\$4297.478	Export visible data as pd

7.4. STEP 4 - VIEW SUMMARY

1. Click Summary tab.

2. Summary tab will show summarize view of input columns values in tabular form. And Normal Distribution



Selected List : Sales Forecast

or Triangle Distribution curve (selected from Settings) from input column separately.

- Just to remind you, as we selected Normal Distribution in Settings tabs. That's why the curve and predicted values are showing in a Normal Distribution manner. If we select Triangular Distribution, Summery table columns, values and the shape of curve will be change accordingly.
- 4. Note you can select only **one** distribution type at a time.

7.5. STEP 5 - IMPORT LIST

- 1. Click "Import" tab.
- 2. Now Contoso Inc. want to import Quarterly profit excel file as SharePoint list and forecast values.
- 3. They have Excel file generated from third party tool with input values of Monte Carlo Stat Add-In.

	Α	В	С	D	E	F	G
1	Title	Q1Profit	Q1Profit_Forcecast	Q2Profit	Q2Profit_Forecast	Q3Profit	Q3Profit_Forecast
2	2019	1000		4000		1000	
3	2018	2000		2000		2500	
4	2017	3000		1500		3000	
5	2016	1500		3000		4000	
6	2015	5000		4000		3000	

4. Select file from windows directory.

Select File:*

Choose Files No file chosen

💿 Open					×
$\leftarrow \rightarrow \land \uparrow \square \diamond$	This PC	C → Drive (F:) → Cognative	ٽ ~	Search Cognat	ive 🔎
Organize 🔻 New 1	folder				
💻 This PC	^	lame ^		Date modified	Туре
3D Objects		Applications		12/8/2018 1:25 PM	File folder
Desktop		Demo Application		3/22/2019 8:01 PM	File folder
Documents	Ę	Contoso Inc Profit		5/1/2019 8:10 PM	Microsoft Excel W
Downloads					
Music					
Pictures					
Videos					
Local Dick (C)					
Local Disk (C:)					
Windows (D:)					
Drive (E:)					
Drive (F:)	v <				>
Fi	ile name	Contoso Inc Profit		Customised F	iles V Cancel

5. After selecting Contoso Inc Profile, you will see a Excel file preview in grid to make sure values are correct.

Select File:* Choose Files Cont	oso Inc Profit.xlsx						
File Preview:							
Title	 Q1 Profit 	 Q1 Profit F 	orcecast~ Q2 Profit	 Q2 Prot 	it Forecast 🖌 Q3 Profit	~ 6	3 Profit Forecast 🗸
2019	1000		4000		1000		
2018	2000		2000		2500		
2017	3000		1500		3000		
2016	1500		3000		4000		
2015	5000		4000		3000		

- 6. There must be a "Title" column in the Excel file with unique values. Other columns should contain numeric and date type values. Otherwise it will generate an error during import process.
- 7. Choose "New List" option from below and enter the list name (Contoso Profit Forecast) you want to create with uploaded Excel values.

```
Import As:* New List 
Select From List

Import As:* New List
```

- Contoso Profit Forecast
- 8. Click Upload.

- 9. After Upload, a Success message will be displayed on top of Import tab with new list name.
 - Monte Carlo Stat Add-in

Home	Table	Summary	Settings	Import	Request Customization
Succes	s : Excel In	nport Successfu	II. New List Na	me :Contoso	o Profit Forecast_01_06_2019_08:29:03_PM
Impor Step 1: Step 2: Step 3: Step 4: Step 5: Note: *	t Instruc Select Exce Preview se Select List Based on S Press "UPI Excel File n	tions: el File from your lected File in Gr Type. E.g. Impo election on step .OAD" button to nust have "Title	r Local Director rid. ort Excel File d; p 3, Enter New o start importir " column as fi	ry. ata to New L v List name o ug data. rst column o	List or in Existing List. or Select Existing List from dropdown. of file.

10. Click on list name "Contoso Profit Forecast_01_06_2019_082903_PM" to open list in SharePoint view. You can also find lists in Site Content section.

+ Nev 2	^p Quick edit	III PowerApps ~						
Conto	so Profit Forecast_01_06_2	019_08:29:03	_PM					
D	Tate -	Children C	OfProfit, formatait ~	ODPorts	Q29roft,Forecast	(32-off	GSPult_Forecast C	+ Add column
0	2016	1.000		4.000		1.000		
	2018	1.000		2.000		I,900		
0	2017	8.000		1300		1.000		
0	2018	4,638		5.000		4,000		
0	2015	5.000		4.000		1.000		

11. Now for forecasting, select "Contoso Profit Forecast_01_06_2019_082903_PM" from settings tab. Select input and output columns and save settings as we have done before with Sales Forecast list.

Monte Carlo Stat Add-in

Home	Table	Summary	Settings	Import	Request Cu	istomization
Select Lis	st :0					
Contos	o Profit For	ecast_01_06_20)19_08:29:03_	PM		
Input Fie	elds					Output Fields
Q1Pro	ofit				•	Q1Profit_Forcecast
Q2Pro	ofit					Q2Profit_Forecast
Q3Pro	ofit					Q3Profit_Forecast
+ Add	ws:0					
5						
No of Iter	ation: 😧					
5						
ype of D	istribution	:0				
Triangu	lar Distribu	tion				
Generate	Simulation	n Log File? 🛛 🖗				
H Save						9 Hel

12. It will then redirect to Table tab.

Monte Carlo Stat Add-in

Home	Table Summary	Settings	Import	Reques	t Customization				
Select Foreca	ted List : Contoso P ast_01_06_2019_08	rofit :29:03_PM						Start Simulation	n
Title	 Q1 Profit 		Q1 Profit For	cecast~	Q2 Profit	Q2 Profit Forecast ~	Q3 Profit	Q3 Profit Forecast	≡
2019	1000				4000		1000		-
2018	2000				2000		2500		
2017	3000				1500		3000		
2016	1500				3000		4000		
2015	5000				4000		3000		
									-
)	

13. Click Start Simulation.

Monte Carlo Stat Add-in

Home Ta	ible Summary	Settings	Import	Request Customization				
Success : S	Simulation Run Succes	sful.						
Selected Forecast_	List : Contoso Pr _01_06_2019_08:	rofit 29:03_PM					Start Simulation	
Title	~ Q1	Profit	~	Q1 Profit Forcecast	Q1 Profit Forcecast Min 💙	Q1 Profit Forcecast Max	 Q1 Profit F 	≡
2019	100	0		2467.898	1253.556	3531.120	2363.004	-
2018	200	0		2703.2	1058.676	4752.845	1647.949	
2017	300	0		2950.819	1321.080	4394.603	2222.454	
2016	150	0		2077.383	1605.118	3028.367	1892.973	
2015	500	0		2713.75	1842.495	3142.667	2620.056	
4		_					•	Ŧ

7.6. REQUEST CUSTOMIZATION

- 1. If a user wants to give some feedback regarding an error of an Add-In, they may follow these steps.
- 2. Go to Request Customization tab.
- 3. Fill out the required fields and click Send.
- 4. It will open the users default mail application, auto-complete the completed fields and it address it to

lome	Table	Summary	Settings	Import	Request Customization				
Req Send yo	uest C	ustomizat	tion slow and we will	get back to	you as early as possible.				
First Na	ame:*								
Jame									
Last Na	me:*								
Willia	m								
Email:*									
jamer	@outlook.	com							
Phone:									
+092	18390187								
Organi	zation:*								
Cogn	itive Conve	rgence							
Reques	st:*								
Feat	ure Reques	t							
Descrip	ption:*								
We w	ant to add	UNIFORM and		listribution ty	pe to forecast values.				
									Se

<u>AppSupport@zagros.onmicrosoft.com</u>. This address may also be used for other feedback, requests for customizations and comments.