Increasing Monthly Savings by Decreasing Monthly Spendings

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Key Dates --->	Define	Measure	Analyze	Improve	Control
	July 3 – July 10	July 11 – August 11	August 12 – August 13	August 14 – August 27	August 28 – September 4

DEFINE

Purpose: Increase monthly savings

Impact:
- Have enough for emergencies
- Paying off debts quicker
- Financial safety net

Goal: Save about 5% (~$165) of my paycheck every month

Spending	
Mean	97.88982143
Standard Error	27.7212269
Median	26.265
Mode	94.99
Standard Deviation	207.4466668
Sample Variance	43034.11957
Kurtosis	12.7393003
Skewness	3.476666464
Range	1117.14
Minimum	2.86
Maximum	1120
Sum	5481.83
Count	56

MEASURE

Data Type:
- dollar spent, continuous
- Date, discrete

Sample size: 30 days

Input (x):
- Bills and Debt payments
- Groceries
- Take-Out Food
- Essential Spending (gas, laundry)
- Random / Unplanned purchases

Output (y): Daily total spent

Defect: 5 (chances of overspending per day)
Units: 30 days in a month
D x U: 150
A: 37
DPO: 0.2467
DPMO: 246,700
SQL: 2.1

ANALYZE

	Groceries	Take Out Food	Total
Week 1	$60.51	$235.04	$295.55
Week 2	$0.00	$61.66	$61.66
Week 3	$43.71	$156.56	$200.27
Week 4	$0.00	$113.63	$113.63
Week 5	$19.64	$106.69	$126.33
Totals	$123.86	$673.58	$797.44

Expected

	Groceries	Take Out
Week 1	$45.91	$249.64
Week 2	$9.58	$52.08
Week 3	$31.11	$169.16
Week 4	$17.65	$95.98
Week 5	$19.62	$106.71

Chi-Square: 43.779
p-value: 7.12944E-09
a: 0.05
Reject the null. There is a relationship between groceries and take out food

Spending Correlation:
Bills & Debts: 0.88
Random: 0.58
Take Out: 0.05

	Bills and Debts	*Groceries*	*Take Out Food*	*Essentials*	*Random*	*Total*
Bills and Debts	1					
Groceries	-0.015405492	1				
Take Out Food	0.050644291	0.064033714	1			
Essentials	-0.084653834	-0.076510929	0.005868123	1		
Random	0.136485673	-0.07420402	-0.108178086	-0.062099937	1	
Total	0.879917329	-0.00417998	0.052340228	-0.04541087	0.581658801	1

IMPROVE

Limit random / unplanned purchases to $125 per week

H0: $\mu_1 \leq \mu_2$
Ha: $\mu_1 > \mu_2$

μ_1 is new spending
μ_2 is original spending

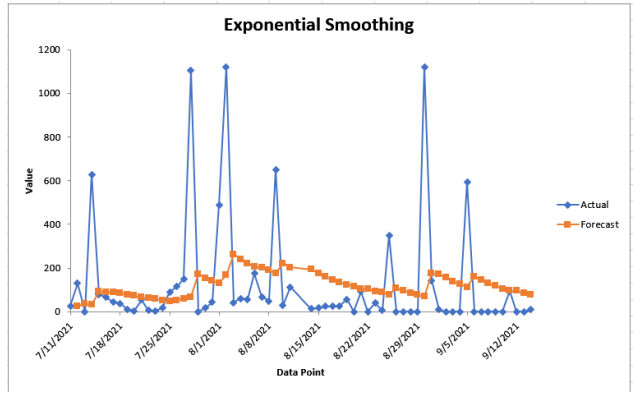
z: 1.407
p-value: 0.159
a: 0.05

Since p-value is larger than a, I don't reject H0.

New Spending	
Mean	46.41929
Standard Error	23.87674
Median	20.97
Mode	#N/A
Standard Deviation	89.33857
Sample Variance	7981.379
Kurtosis	12.50522
Skewness	3.471735
Range	346.57
Minimum	3.43
Maximum	350
Sum	649.87
Count	14

CONTROL

I used dampfact = 0.9 to predict what my total spending will be for the next 2 weeks of my improve phase since I ran out of time.



Define

- My goal was to increase my monthly savings by decreasing my monthly spending of about 5% of my paycheck (~ $165).
- I will know I've been successful when I am able to put more than $150 into my savings account every month.
- Output (y) is total spending per day
- Input (x):
  - Bill and Debts payments (current budget is set at $3500 per month)
  - Groceries (current budget is set at $100 per week)
  - Take Out Food (current budget is set at $100 per week)
  - Essentials (gas, laundry, etc) (current budget is set at $50 per week)
  - Random / Unplanned Purchases (current budget is set at $50 per week)

Measure

- I am collecting the dollar amount I spent everyday and setting it up into 5 different categories (Bills & Debts, Groceries, Take Out Food, Essentials, and Random / Unplanned purchases).
- My data is continuous because dollar is a continuous data. Another data I am tracking is date and that is a discrete data.
- I am collecting my own data by using my monthly bank statements. I would log into my online bank account and download my bank statements from July 11, 2021 through August 11, 2021. Then I would record my spending in an Excel file and dividing the spending into the 5 categories.
- I am only focusing on a month's worth of data starting from July 11, 2021 through August 11, 2021 because of the limited time we had for this project. I would have liked to use a year's worth of data but the past year spending had been unusual because of COVID and other factors. The risk of using a smaller sample size is not getting the outliers that could potentially happen.

Analyze – 5 Tools

The 5 statistics tools that I used for this project are:

- Descriptive Statistics
- Chi-Square Test
- Correlation
- Exponential Smoothing
- Hypothesis Test (this will be under Improve slide)

Analyze – Descriptive Statistics

- The image to the right is the descriptive statistics for my original month data collection. The descriptive statistics will be used later in the improve phase for hypothesis test.

Spending	
Mean	97.88982143
Standard Error	27.7212269
Median	26.265
Mode	94.99
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Range	1117.14
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Maximum	1120
Sum	5481.83
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Analyze – Chi-Square Test

	Groceries	Take Out Food	Total
Week 1	$60.51	$235.04	$295.55
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Week 3	$43.71	$156.56	$200.27
Week 4	$0.00	$113.63	$113.63
Week 5	$19.64	$106.69	$126.33
Totals	$123.86	$673.58	$797.44
Expected			
	Groceries	**Take Out**	
Week 1	$45.91	$249.64	
Week 2	$9.58	$52.08	
Week 3	$31.11	$169.16	
Week 4	$17.65	$95.98	
Week 5	$19.62	$106.71	
Chi-Square	43.77944228		
p-Value	7.12944E-09		

- Below is my calculation for Chi-Square Test to see if there was a relationship between Groceries and Take Out Food. The reason why I was only focused on these two is because I was curious to see the results of the relationship between the two. If there was a relationship, then I was thinking on focusing on buying less take out food.
- The alpha I used is 0.05.
- Since p-value is less than alpha, I concluded that there is a relationship between Groceries and Take Out Food category.

Analyze - Correlation

- I ran a correlation test to see what percentage the 5 categories are contributing to the total monthly spending.

	Bills and Debts	*Groceries*	*Take Out Food*	*Essentials*	*Random*	*Total*
Bills and Debts	1					
Groceries	-0.015405492	1				
Take Out Food	0.050644291	0.064033714	1			
Essentials	-0.084653834	-0.076510929	0.005868123	1		
Random	0.136485673	-0.07420402	-0.108178086	-0.062099937	1	
Total	0.879917329	-0.00417998	0.052340228	-0.04541087	0.581658801	1

- As you can see in the image above, the top three categories that contribute to the total monthly spending are Bills and Debts, Take Out Food, Random / Unplanned.
  - Bills and Debts was an obvious result since that is the category that I spend most of my money in every month and I am unable to make changes to this for improvements, so I left this alone.
  - I thought Take Out Food category would have had more impact on my total monthly spending, so I was surprised to see this result. In the improve phase, I still decided to make changes here if not for spending purposes but for health reasons.
  - I do have a habit of impulse buying online so I'm not surprise by Random / Unplanned category result. In the improve phase, I focused on spending less on random purchases to see if helps improve my total monthly spending.

Analyze - SQL

- My baseline SQL is:
  - **Defect:** 5 (chances of overspending per day)
  - **Units**: 30 days in a month
  - **D x U**: 150
  - **A**: 37
  - **DPO**: 0.2467
  - **DPMO**: 246,700
  - **SQL**: 2.2

- My new SQL is:
  - **Defect: 5** (chances of overspending per day)
  - **Units**: 30 days in a month
  - **D x U**: 150
  - **A**: 12
  - **DPO**: 0.08
  - **DPMO**: 80,000
  - **SQL**: 2.9

The reason why I think my defect is 5 is because I have 5 categories for spending.

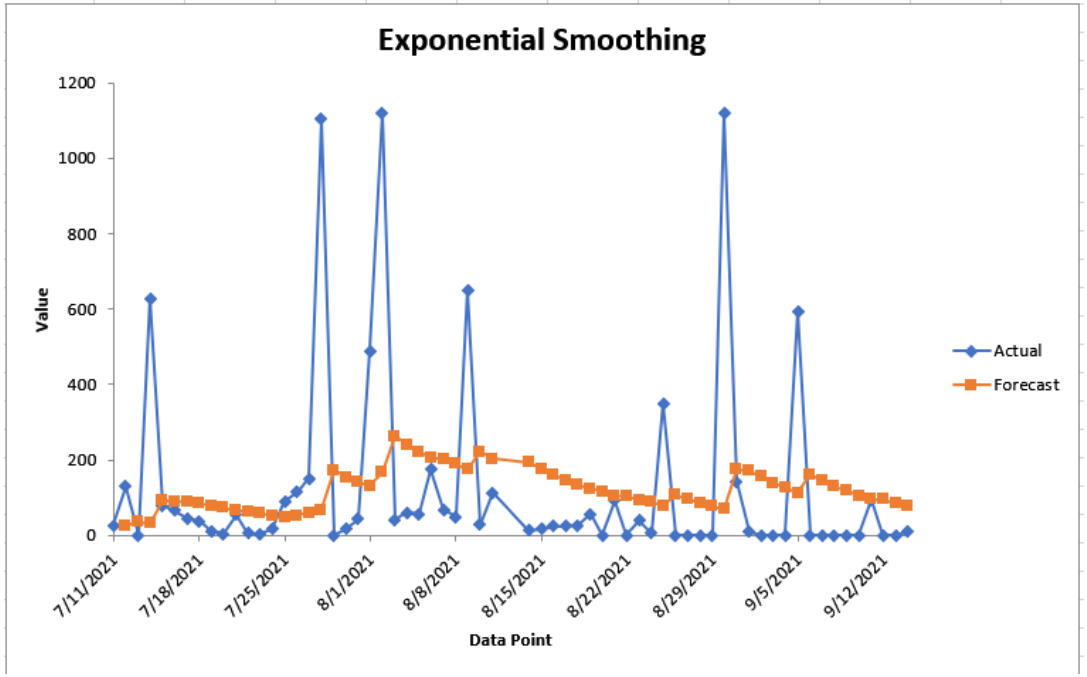
Based on the result, there is definite improvement between my baseline SQL and my new SQL, which shows that my new method is working.

Analyze – Exponential Smoothing

I ran an exponential smoothing chart using a dampfact of 0.9 to predict data for August 28, 2021 through September 14, 2021 to get the predicted total month spending. Since Bills and Debts category is consistent every month, I added those data in ahead of time.

Based on the predicted data, the predicted total pending for this month is $2,097.21

The first month of total spending is $5,481.83. Since the predicted data is lower than the first month total, it shows that my method work, and I will be saving money.



Improve – Hypothesis Test

- The solution I proposed is to decrease my spending for Random / Unplanned purchases to $125 per week.
- I ran a hypothesis test to see if there is a significance difference between the new improve methods and the original method.
- **H_0**: $\mu 1 \leq \mu 2$ **H_a**: $\mu 1 > \mu 2$ μ_1 is new spending
- **z:** 1.407; **p-value**: 0.159; **a**: 0.05 μ_2 is original spending
- Since p-value is larger that the alpha, I must reject the null hypothesis. Because of that, I am unable to provide a definitive answer because the new spending method is lacking two weeks worth of data.

Old Spending		*New Spending*	
Mean	97.88982	Mean	46.41929
Standard Error	27.72123	Standard Error	23.87674
Median	26.265	Median	20.97
Mode	94.99	Mode	#N/A
Standard Deviation	207.4467	Standard Deviation	89.33857
Sample Variance	43034.12	Sample Variance	7981.379
Kurtosis	12.7393	Kurtosis	12.50522
Skewness	3.476666	Skewness	3.471735
Range	1117.14	Range	346.57
Minimum	2.86	Minimum	3.43
Maximum	1120	Maximum	350
Sum	5481.83	Sum	649.87
Count	56	Count	14

Control

- I am already saving money based on the two weeks of improvements. If I keep on following this solution, based on the exponential smoothing chart I ran, I will be able to spend less money on random / unplanned purchases.
- Based on the results of the improve phase, it looks like the experiment for this project was a success.