

A half-baked idea

ERROR AND UNCERTAINTY IN SPREADSHEETS



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Data overview

- Sales data from Risky Business Bakery
- Columns
 - Transaction ID
 - Day
 - Date
 - Time
 - Item
 - Price

	A	B	C	D	E	F
1	Transaction ID	Day	Date	Time	Item	Price
2	6483	Monday	2/13/2017	8:35:01	Bread	\$0.95
3	6484	Monday	2/13/2017	9:04:35	Coffee	\$1.25
4	6484	Monday	2/13/2017	9:04:35	Baguette	\$2.50
5	6485	Monday	2/13/2017	9:33:28	Coffee	\$1.25
6	6486	Monday	2/13/2017	9:33:58	Hot chocolate	\$2.10
7	6486	Monday	2/13/2017	9:33:58	Toast	\$1.40
8	6487	Monday	2/13/2017	9:47:21	Coffee	\$1.25
9	6487	Monday	2/13/2017	9:47:21	Bread	\$0.95
10	6487	Monday	2/13/2017	9:47:21	Alfajores	\$2.95
11	6488	Monday	2/13/2017	10:03:37	Alfajores	\$2.95
12	6488	Monday	2/13/2017	10:03:37	Coffee	\$1.25
13	6488	Monday	2/13/2017	10:03:37	Bread	\$0.95
14	6489	Monday	2/13/2017	10:13:23	Bread	\$0.95
15	6490	Monday	2/13/2017	10:17:46	Coffee	\$1.25
16	6491	Monday	2/13/2017	10:37:23	Coffee	\$1.25
17	6491	Monday	2/13/2017	10:37:23	Coffee	\$1.25
18	6492	Monday	2/13/2017	10:38:25	Coffee	\$1.25
19	6493	Monday	2/13/2017	10:42:11	Hot chocolate	\$2.10
20	6494	Monday	2/13/2017	10:53:03	Coffee	\$1.25
21	6494	Monday	2/13/2017	10:53:03	Juice	\$1.95
22	6495	Monday	2/13/2017	11:02:54	Coffee	\$1.25
23	6495	Monday	2/13/2017	11:02:54	Pastry	\$3.00
24	6496	Monday	2/13/2017	11:04:06	Pastry	\$3.00
25	6496	Monday	2/13/2017	11:04:06	Coffee	\$1.25

It's all adding up

- `SUMIF()`
 - `range` : cells to apply parameter to
 - `criterion` : parameter to apply
 - `sum_range` : cells to add

It's about time

- 0: Midnight
- 1: 11:59:59
- Example: 11:04:06 AM = 0.4611805
- Example: noon = 0.5

A UNIQUE() challenge

- UNIQUE()
- SORT()
- Calculating percentages:
 - amount / sum
 - =L2 / SUM(L\$2:L\$10)

K	L	M
Item	Total Sales	% of Total Sales
Alfajores	180.84	5.03%
Baguette	68.00	1.89%
Bread	252.13	7.01%
Brownie	124.15	3.45%
Cake	452.25	12.58%
Chicken Stev	108.15	3.01%
Coffee	700.50	19.48%
Cookies	117.68	3.27%
Fudge	26.04	0.72%
Hot chocolat	122.22	3.40%
Jam	6.30	0.18%
Juice	84.63	2.35%
Muffin	51.48	1.43%
Pastry	165.60	4.61%
Sandwich	468.60	13.03%
Scone	132.00	3.67%

Let's practice!

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Do you know your muffins, man?

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It's a DATE()

- `FILTER()`
 - Ex: `FILTER(A2:B10, A2:A10 > 10)`

- `DATE()`
 - `year` , `month` , and `day`
- ```
FILTER(H1:M14, J1:J14 <=
DATE(2017,2,13))
```

| H              | I         | J         | K        | L            | M      |
|----------------|-----------|-----------|----------|--------------|--------|
| Transaction ID | Day       | Date      | Time     | Item         | Price  |
| 6483           | Monday    | 2/13/2017 | 8:35:01  | Bread        | \$0.95 |
| 6484           | Monday    | 2/13/2017 | 9:04:35  | Coffee       | \$1.25 |
| 6484           | Monday    | 2/13/2017 | 9:04:35  | Baguette     | \$2.50 |
| 6485           | Monday    | 2/13/2017 | 9:33:28  | Coffee       | \$1.25 |
| 6486           | Monday    | 2/13/2017 | 9:33:58  | Hot chocolat | \$2.10 |
| 6547           | Tuesday   | 2/14/2017 | 9:54:03  | Coffee       | \$1.25 |
| 6548           | Tuesday   | 2/14/2017 | 10:03:42 | Coffee       | \$1.25 |
| 6548           | Tuesday   | 2/14/2017 | 10:03:42 | Bread        | \$0.95 |
| 6548           | Tuesday   | 2/14/2017 | 10:03:42 | Toast        | \$1.40 |
| 6605           | Wednesday | 2/15/2017 | 12:00:27 | Cake         | \$3.75 |
| 6606           | Wednesday | 2/15/2017 | 12:07:28 | Bread        | \$0.95 |
| 6606           | Wednesday | 2/15/2017 | 12:07:28 | Coffee       | \$1.25 |
| 6607           | Wednesday | 2/15/2017 | 12:28:50 | Bread        | \$0.95 |
|                |           |           |          |              |        |
| 6483           | Monday    | 2/13/2017 | 8:35:01  | Bread        | 0.95   |
| 6484           | Monday    | 2/13/2017 | 9:04:35  | Coffee       | 1.25   |
| 6484           | Monday    | 2/13/2017 | 9:04:35  | Baguette     | 2.50   |
| 6485           | Monday    | 2/13/2017 | 9:33:28  | Coffee       | 1.25   |
| 6486           | Monday    | 2/13/2017 | 9:33:58  | Hot chocolat | 2.10   |



# Function review

- `STDEV()` : average distance from the average value
- `T.TEST()` : differences between groups
  - `range1` , `range2`
  - `tails` : 1 or 2
  - `type` : 1, 2, or 3

# Let's practice!

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# Is change on the menu?

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# Baking in the rain?



# Data overview

- Inches of Rain : **daily** total
- MAXIFS()
  - range
  - criteria\_range1
  - criterion1

|    | A          | B      | C         | D        | E             | F      | G              |
|----|------------|--------|-----------|----------|---------------|--------|----------------|
| 1  | Transactio | Day    | Date      | Time     | Item          | Price  | Inches of Rain |
| 2  | 6483       | Monday | 2/13/2017 | 8:35:01  | Bread         | \$0.95 | 0              |
| 3  | 6484       | Monday | 2/13/2017 | 9:04:35  | Coffee        | \$1.25 | 0              |
| 4  | 6484       | Monday | 2/13/2017 | 9:04:35  | Baguette      | \$2.50 | 0              |
| 5  | 6485       | Monday | 2/13/2017 | 9:33:28  | Coffee        | \$1.25 | 0              |
| 6  | 6486       | Monday | 2/13/2017 | 9:33:58  | Hot chocolate | \$2.10 | 0              |
| 7  | 6486       | Monday | 2/13/2017 | 9:33:58  | Toast         | \$1.40 | 0              |
| 8  | 6487       | Monday | 2/13/2017 | 9:47:21  | Coffee        | \$1.25 | 0              |
| 9  | 6487       | Monday | 2/13/2017 | 9:47:21  | Bread         | \$0.95 | 0              |
| 10 | 6487       | Monday | 2/13/2017 | 9:47:21  | Alfajores     | \$2.95 | 0              |
| 11 | 6488       | Monday | 2/13/2017 | 10:03:37 | Alfajores     | \$2.95 | 0              |
| 12 | 6488       | Monday | 2/13/2017 | 10:03:37 | Coffee        | \$1.25 | 0              |
| 13 | 6488       | Monday | 2/13/2017 | 10:03:37 | Bread         | \$0.95 | 0              |
| 14 | 6489       | Monday | 2/13/2017 | 10:13:23 | Bread         | \$0.95 | 0              |
| 15 | 6490       | Monday | 2/13/2017 | 10:17:46 | Coffee        | \$1.25 | 0              |
| 16 | 6491       | Monday | 2/13/2017 | 10:37:23 | Coffee        | \$1.25 | 0              |
| 17 | 6491       | Monday | 2/13/2017 | 10:37:23 | Coffee        | \$1.25 | 0              |
| 18 | 6492       | Monday | 2/13/2017 | 10:38:25 | Coffee        | \$1.25 | 0              |

# Correlation review

- `CORREL(A:A, B:B)`
- Relationship
  - Negative
  - Positive
- Strength
  - **Weak:** 0.0 to  $\pm 0.3$
  - **Moderate:**  $\pm 0.3$  to  $\pm 0.7$
  - **Strong:**  $\pm 0.7$  to  $\pm 1.0$

# Let's practice!

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# Review: Are we certain now?

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# Hungry for profits



# How random

- `RANDBETWEEN()`
  - Upper and lower limit
- `RANDBETWEEN(0, 2)`
  - 0, 1, or 2
  - Useful for modeling different conditions

|    | A            | B      | C         | D      | E            | F         |
|----|--------------|--------|-----------|--------|--------------|-----------|
| 1  | 2/13-2/19    |        | 2/20-2/28 |        | 2/20-2/28    |           |
| 2  | Item         | Price  | Item      | Price  | New Quantity | New Price |
| 3  | Bread        | \$0.95 | Bread     | \$0.86 | 2            | 1.71      |
| 4  | Coffee       | \$1.25 | Brownie   | \$2.93 | 0            | 0.00      |
| 5  | Baguette     | \$2.50 | Coffee    | \$1.50 | 0            | 0.00      |
| 6  | Coffee       | \$1.25 | Coffee    | \$1.50 | 0            | 0.00      |
| 7  | Hot chocolat | \$2.10 | Coffee    | \$1.50 | 0            | 0.00      |
| 8  | Toast        | \$1.40 | Coffee    | \$1.50 | 0            | 0.00      |
| 9  | Coffee       | \$1.25 | Scone     | \$2.48 | 1            | 2.48      |
| 10 | Bread        | \$0.95 | Coffee    | \$1.50 | 1            | 1.50      |
| 11 | Alfajores    | \$2.95 | Bread     | \$0.86 | 0            | 0.00      |
| 12 | Alfajores    | \$2.95 | Fudge     | \$2.79 | 2            | 5.58      |
| 13 | Coffee       | \$1.25 | Fudge     | \$2.79 | 0            | 0.00      |
| 14 | Bread        | \$0.95 | Coffee    | \$1.50 | 2            | 3.00      |
| 15 | Bread        | \$0.95 | Bread     | \$0.86 | 1            | 0.86      |
| 16 | Coffee       | \$1.25 | Coffee    | \$1.50 | 1            | 1.50      |

# Revisiting sparklines

- SPARKLINE()
  - data : The cell(s) to plot
  - options : Options to configure the plot
    - charttype : bar, line, etc.
    - max : upper limit

|                               |            |             |
|-------------------------------|------------|-------------|
| Sales Before Price Change     | \$1,944.95 | <div></div> |
| Sales After Price Change      | \$1,650.75 | <div></div> |
| Est. Sales After Price Change | \$1,682.82 | <div></div> |
|                               |            |             |
| Before vs. After              | 0.00190121 |             |
| After vs. Estimated           | 0.62964326 |             |
| Before vs. Estimated          | 0.09487231 |             |
|                               |            |             |

# Revisiting sparklines

```
=SPARKLINE(H2, {"charttype", "bar"; "max", MAX(H$2:H$10)})
```

| Precinct  | # Injured |
|-----------|-----------|
| WEST      | 14        |
| MADISON   | 48        |
| NORTH     | 15        |
| SOUTH     | 63        |
| EAST      | 8         |
| HERMITAGE | 41        |
| CENTRAL   | 30        |
| MIDTOWN   | 54        |
| UNKNOWN   | 7         |

`=SPARKLINE(H2, {"charttype", "bar"; "max", MAX(H$2:H$10)})`

`SPARKLINE(data, [options])`

Example

`SPARKLINE(A2:E2, {"charttype", "bar"; "max", 50})`

Summary

Creates a miniature chart contained within a single cell.

data

The range or array containing the data to plot.

options - [optional]

A range or array of optional settings and associated values used to customize the chart.

# Let's practice!

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# Wrap-up

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# Chapter 1

- Correlations
  - `CORREL()`
- Summary statistics
  - `SUMIFS()`
  - `AVERAGEIF()`
  - `COUNTIFS()`

# Chapter 2

- Predictions
  - `FORECAST()`
  - `WEIGHTED.AVERAGE()`
- Prediction accuracy
  - `ABS()`



# Chapter 3

- Variation
  - `RANDBETWEEN()`
  - `FILTER()`
  - `SORT()`
  - `SPARKLINE()`
- Psychology of risk perception
  - Loss aversion

# Chapter 4

- Case study
  - Risky Business Bakery

# Next steps

- [Data Visualization with Spreadsheets](#)
- [Pivot Tables with Spreadsheets](#)

# To an uncertain future!

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