Bank Director

Breakout 1:
How to Use Data to Manage Risk at Your Bank

#BDAudit23

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Data Analytics: How to Get Started

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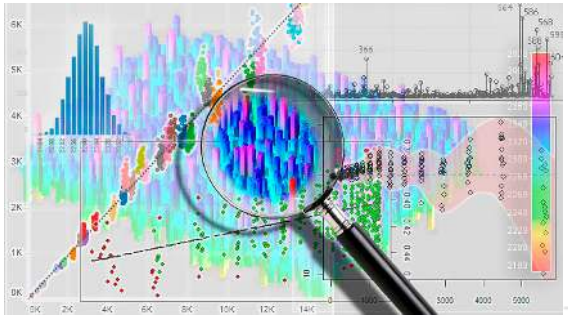
Use of Data Analytics

How Data Analytics Contributes to Objectivity and Integrity

- Approaching decisions in a more data-driven way can help reduce unintended bias
- It can also help us see patterns and trends that our naked eye may not put together, or in some cases, that we may not want to see or believe



Data Analytics Defined

- Data analytics is the process of inspecting, normalizing, and processing data in order to support decision making and draw conclusions

- When performed effectively, data analytics allows you to examine significant amounts of data in a short period of time

Data Fundamental - Relational Databases

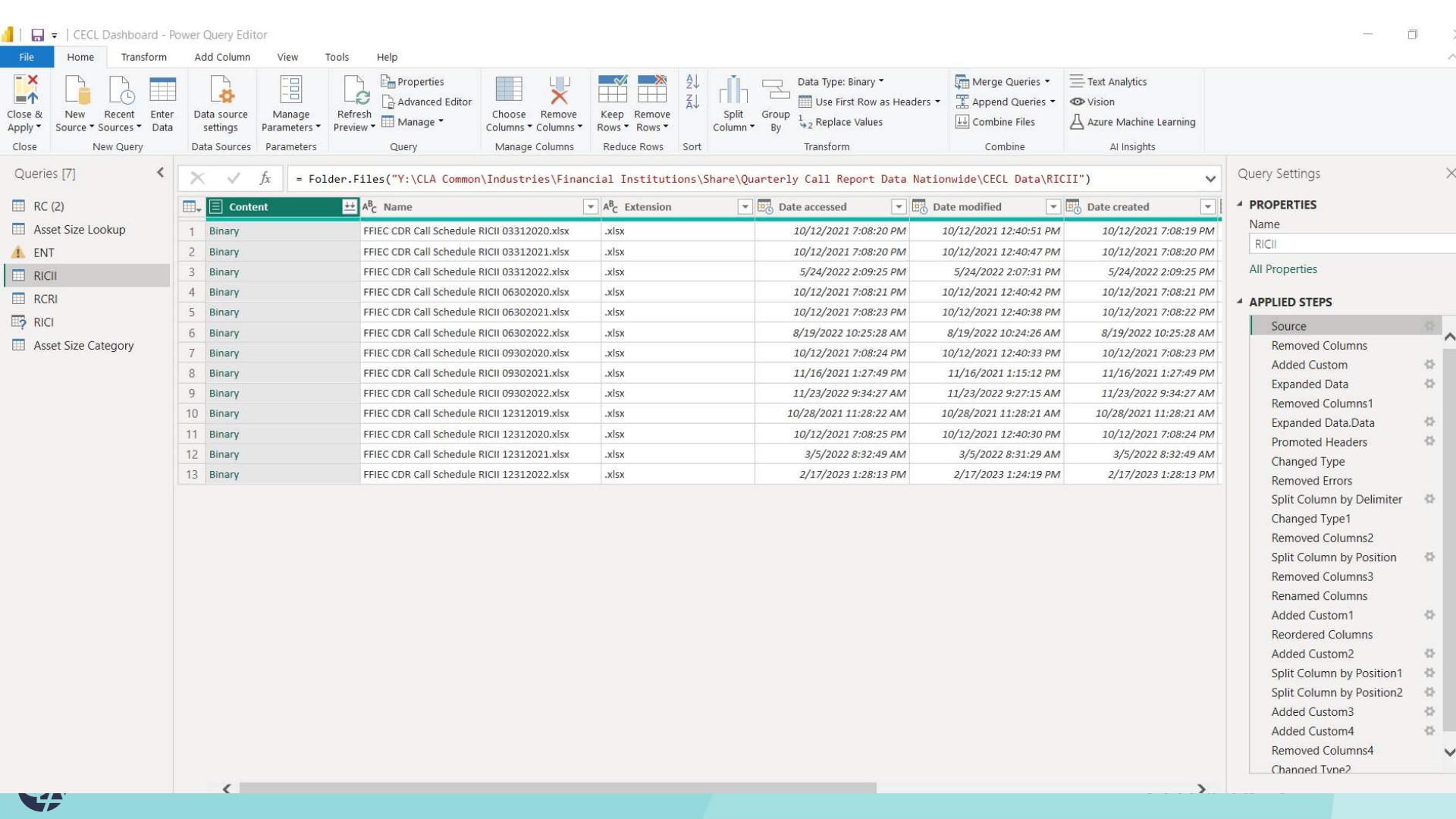
- A relational database is when one table uses a unique identifier to look up records in another table
- Understanding what makes a record unique
- Unique identifiers: transaction ID, record number, vendor ID, employee ID, combination of fields
- Relational databases are a common and useful way for data to be stored. Most encountered database utilize relational databases

Data Analytics Tools

- Spreadsheet/Excel
- Database Software; Access, SQL, others
- Auditing/Data Interrogation Software: IDEA, ACL
- Others
- Tools and desired capabilities
    - Analyze large sets of data efficiently
    - Work with many types of data
    - Robust analytical capability built in
    - Ability to program (macro, script) repeatable processes
    - Logging all procedures and work steps
    - Read only
    - User friendly

Microsoft Tools

- Power Query
- Power Automate
- Power Bi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File
Home
Transform
Add Column
View
Tools
Help
Close & Apply
New Source
Recent Sources
Enter Data
Data source settings
Manage Parameters
Refresh Preview
Properties
Advanced Editor
Manage
Choose Columns
Remove Columns
Keep Rows
Remove Rows
Split Column
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Data Type: Binary
Use First Row as Headers
Replace Values
Merge Queries
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Combine Files
Text Analytics
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Azure Machine Learning
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PROPERTIES
Name
RICII
All Properties
APPLIED STEPS
Source
Removed Columns
Added Custom
Expanded Data
Removed Columns1
Expanded Data.Data
Promoted Headers
Changed Type
Removed Errors
Split Column by Delimiter
Changed Type1
Removed Columns2
Split Column by Position
Removed Columns3
Renamed Columns
Added Custom1
Reordered Columns
Added Custom2
Split Column by Position1
Split Column by Position2
Added Custom3
Added Custom4
Removed Columns4
Changed Type2

Date
- (Blank)
- 12/31/2019
- 3/31/2020
- 6/30/2020
- 9/30/2020
- 12/31/2020
- 3/31/2021
- 6/30/2021
- 9/30/2021
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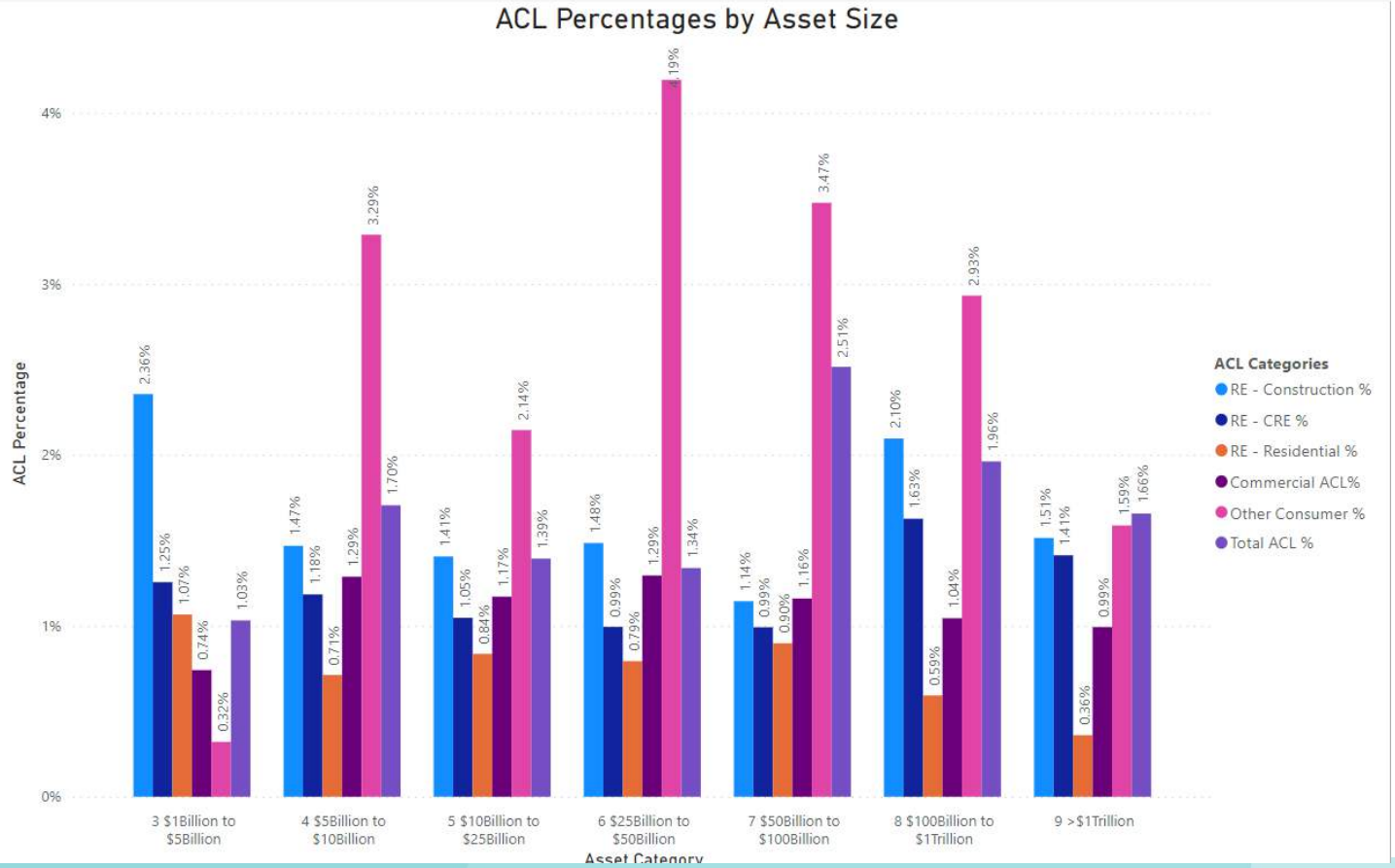


Categories of Data Analytics

- Population
- People
- Trending
- Transaction

Data Analytics Process

- What is your goal? What do you hope to accomplish?
- Data gathering
- Ensure population completeness
- Data normalization
- Data evaluation

Examples of Data Analytics

- Benford's Law

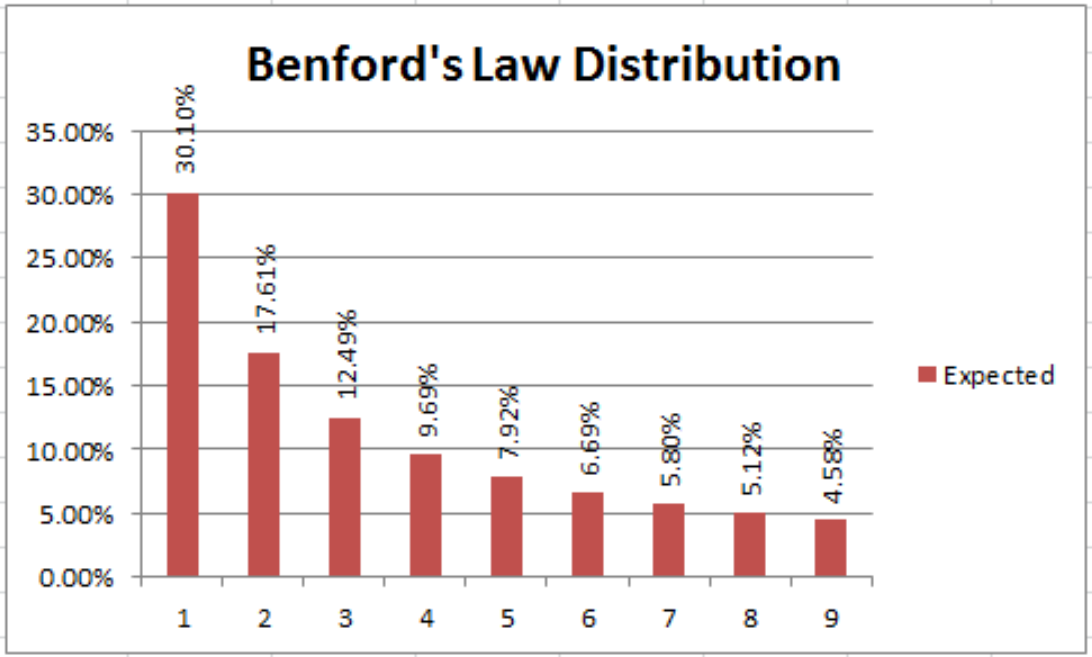
- Accounts payable/employee expenditures

Benford's Law

- Mathematical principle that states in any large, randomly produced set of natural numbers, the leading digit of each number will occur a certain percentage of the time

Benford's Law

Digit	Expected
1	30.10%
2	17.61%
3	12.49%
4	9.69%
5	7.92%
6	6.69%
7	5.80%
8	5.12%
9	4.58%
	100.00%

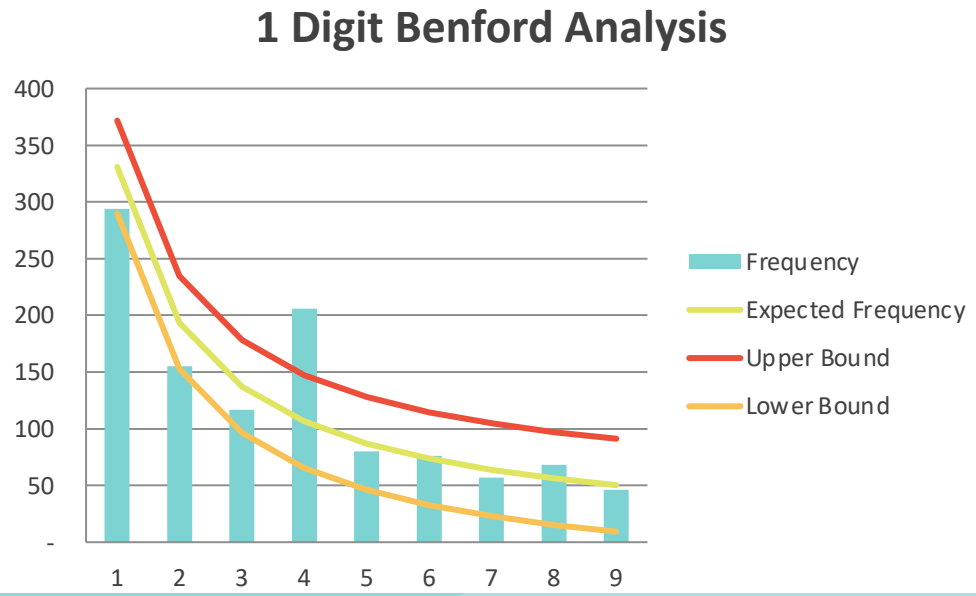


Benford's Law

- Example: Use in Analyzing Expenditures
  - Manufacturing company which required dual signature on expenses over $5,000
  - Expenses under $5,000 only required an accounting employee's signature
  - Controller of company was embezzling funds by paying fictitious vendors
  - How could Benford's Law have helped?

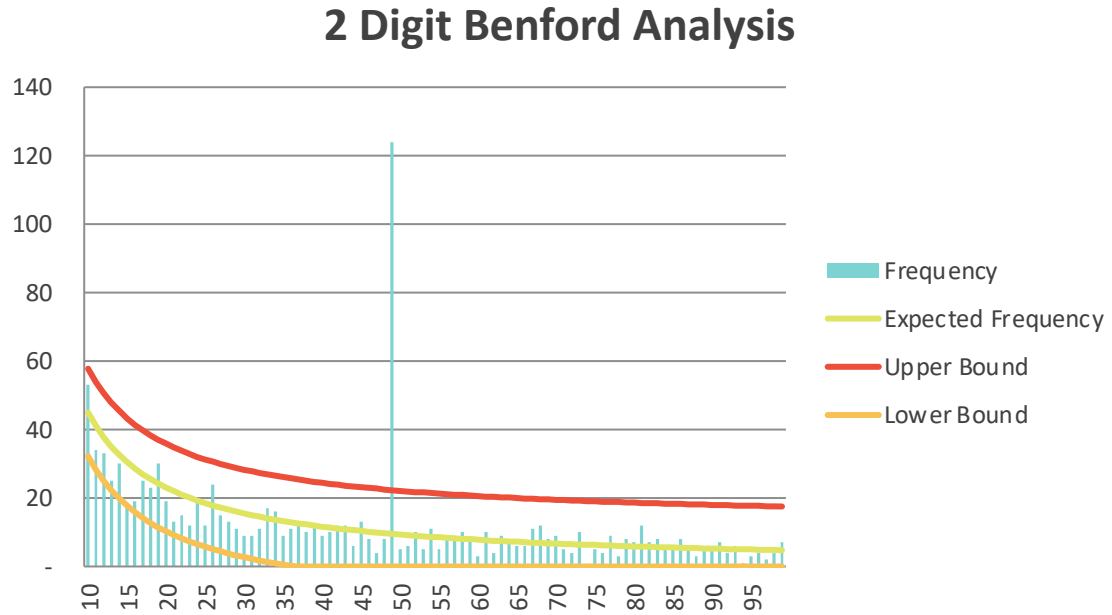
Benford's Law

- The Benford's law distribution of expenditures paid for this company is as follows:



Benford's Law

- The 2 digit Benford's law distribution of expenditures paid for this company is as follows:



Benford's Law

- The Controller was authorizing checks for just under $5,000, so the dual control procedure was not performed

- The application of Benford's Law would have identified an inconsistency in the data which would have been investigated

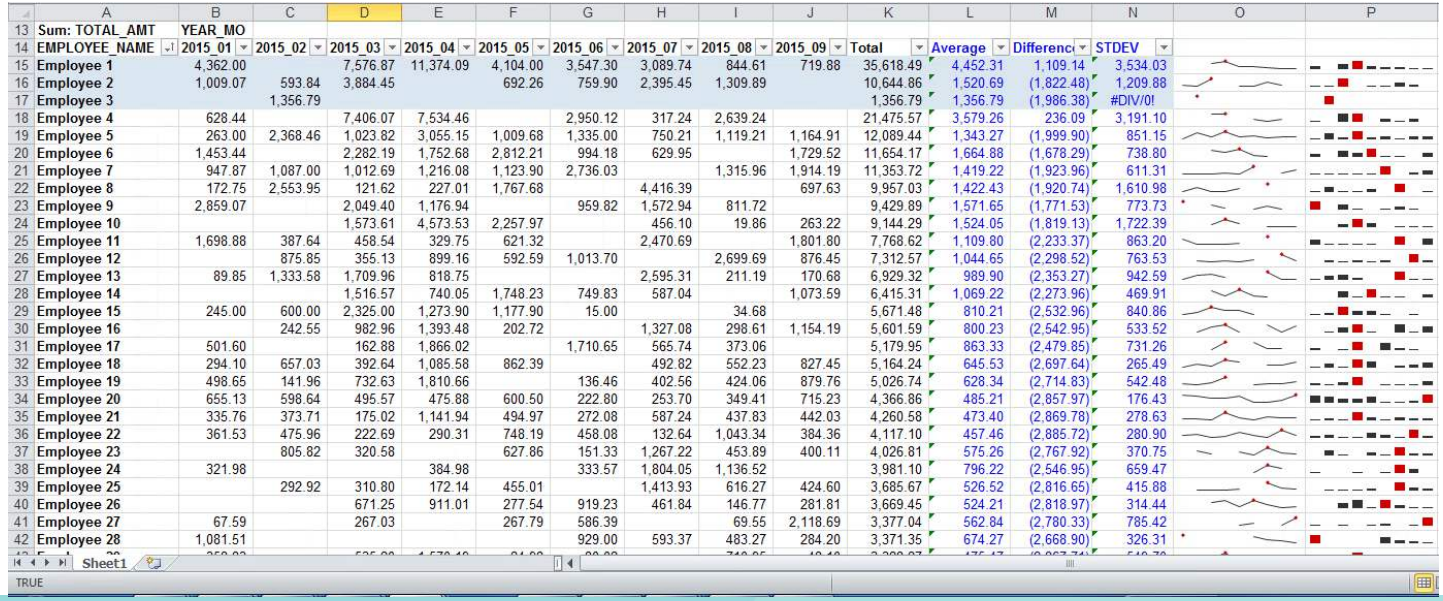
Accounts Payable/Employee Expenditures

- What do we want to accomplish?
  - Identify potential fictitious vendors via unusual transaction activity
  - Identify unusual employee reimbursements for expenses

- What types of data analytics would best serve our goal?
  - People – Who is submitting expenses and what is their frequency and dollar volume

Accounts Payable/Employee Expenditures – People

- Review trends in expense submissions to those of other employees, as well as historical submissions



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
13	Sum: TOTAL_AMT	YEAR_MO														
14	EMPLOYEE_NAME	2015_01	2015_02	2015_03	2015_04	2015_05	2015_06	2015_07	2015_08	2015_09	Total	Average	Differenc	STDEV		
15	Employee 1	4,362.00		7,576.87	11,374.09	4,104.00	3,547.30	3,089.74	844.61	719.88	35,618.49	4,452.31	1,109.14	3,534.03		
16	Employee 2	1,009.07	593.84	3,884.45		692.26	759.90	2,395.45	1,309.89		10,644.86	1,520.69	(1,822.48)	1,209.88		
17	Employee 3		1,356.79								1,356.79	1,356.79	(1,986.38)	#DIV/0!		
18	Employee 4	628.44		7,406.07	7,534.46		2,950.12	317.24	2,639.24		21,475.57	3,579.26	236.09	3,191.10		
19	Employee 5	263.00	2,368.46	1,023.82	3,055.15	1,009.68	1,335.00	750.21	1,119.21	1,164.91	12,089.44	1,343.27	(1,999.90)	851.15		
20	Employee 6	1,453.44		2,282.19	1,752.68	2,812.21	994.18	629.95		1,729.52	11,654.17	1,664.88	(1,678.29)	738.80		
21	Employee 7	947.87	1,087.00	1,012.69	1,216.08	1,123.90	2,736.03		1,315.96	1,914.19	11,353.72	1,419.22	(1,923.96)	611.31		
22	Employee 8	172.75	2,553.95	121.62	227.01	1,767.68		4,416.39		697.63	9,957.03	1,422.43	(1,920.74)	1,610.98		
23	Employee 9	2,859.07		2,049.40	1,176.94		959.82	1,572.94	811.72		9,429.89	1,571.65	(1,771.53)	773.73		
24	Employee 10			1,573.61	4,573.53	2,257.97		456.10	19.86	263.22	9,144.29	1,524.05	(1,819.13)	1,722.39		
25	Employee 11	1,698.88	387.64	458.54	329.75	621.32		2,470.69		1,801.80	7,768.62	1,109.80	(2,233.37)	863.20		
26	Employee 12		875.85	355.13	899.16	592.59	1,013.70		2,699.69	876.45	7,312.57	1,044.65	(2,298.52)	763.53		
27	Employee 13	89.85	1,333.58	1,709.96	818.75			2,595.31	211.19	170.68	6,929.32	989.90	(2,353.27)	942.59		
28	Employee 14			1,516.57	740.05	1,748.23	749.83	587.04		1,073.59	6,415.31	1,069.22	(2,273.96)	469.91		
29	Employee 15	245.00	600.00	2,325.00	1,273.90	1,177.90	15.00		34.68		5,671.48	810.21	(2,532.96)	840.86		
30	Employee 16		242.55	982.96	1,393.48	202.72		1,327.08	298.61	1,154.19	5,601.59	800.23	(2,542.95)	533.52		
31	Employee 17	501.60		162.88	1,866.02		1,710.65	565.74	373.06		5,179.95	863.33	(2,479.85)	731.26		
32	Employee 18	294.10	657.03	392.64	1,085.58	862.39		492.82	552.23	827.45	5,164.24	645.53	(2,697.64)	265.49		
33	Employee 19	498.65	141.96	732.63	1,810.66		136.46	402.56	424.06	879.76	5,026.74	628.34	(2,714.83)	542.48		
34	Employee 20	655.13	598.64	495.57	475.88	600.50	222.80	253.70	349.41	715.23	4,366.86	485.21	(2,857.97)	176.43		
35	Employee 21	335.76	373.71	175.02	1,141.94	494.97	272.08	587.24	437.83	442.03	4,260.58	473.40	(2,869.78)	278.63		
36	Employee 22	361.53	475.96	222.69	290.31	748.19	458.08	132.64	1,043.34	384.36	4,117.10	457.46	(2,885.72)	280.90		
37	Employee 23		805.82	320.58		627.86	151.33	1,267.22	453.89	400.11	4,026.81	575.26	(2,767.92)	370.75		
38	Employee 24	321.98			384.98		333.57	1,804.05	1,136.52		3,981.10	796.22	(2,546.95)	659.47		
39	Employee 25		292.92	310.80	172.14	455.01		1,413.93	616.27	424.60	3,685.67	526.52	(2,816.65)	415.88		
40	Employee 26			671.25	911.01	277.54	919.23	461.84	146.77	281.81	3,669.45	524.21	(2,818.97)	314.44		
41	Employee 27	67.59		267.03		267.79	586.39		69.55	2,118.69	3,377.04	562.84	(2,780.33)	785.42		
42	Employee 28	1,081.51					929.00	593.37	483.27	284.20	3,371.35	674.27	(2,668.90)	326.31		

Sheet1

TRUE

Other Considerations

- Review branches/managers for waiving of fees at higher rate than peers
- Looking for loan originations right up to the officer's limit
- Trend vendor payments for unusual or unexpected increases

Takeaways

- Data analytics is a means to analyze large volumes of data
- When setup properly, meaningful results can be generated to focus audit procedures, and identify potential malicious activity
- You most likely can perform data analytics with tools already available to you

Thank you!!

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