

Using Excel to Enhance Your Audit Analytics

ACUIA Annual Conference June 2013

Disclaimers

- I am NOT a statistician, I'm just a humble, caveman auditor
- This is not a presentation about statistics, it's about how to streamline your analytics using Excel
- I don't fully cover the limitations of the types of analyses reviewed in the presentation

Outline

- Risk Heat Maps (Colors = Pretty)
- Summarizing Information (Subtotal, Pivot Tables, Filters)
- A Crash Course on Benford's Law
- Bird's Eye View of Regression Analysis
- Using INDEX..MATCH method to match 3+ Fields Between Two Different Records (So Long, VLOOKUP!!!)

What are Risk Heat Maps?

- Sexier name for conditional formatting
- Good for analyzing matrices of financial data at multiple locations
- Show gradient color scales based on user input

So...How Is It Practical???

- Brain is overwhelmingly impacted by colors (marketing)
- Let's test this...

how do **COLORS** Affect Purchases?

For retailers, shopping is the art of persuasion. Though there are many factors that influence how and what consumers buy. However, a great deal is decided by visual cues, the strongest and most persuasive being color.



Color and Marketing

- When marketing new products it is crucial to consider that consumers place visual appearance and color above other factors when shopping.



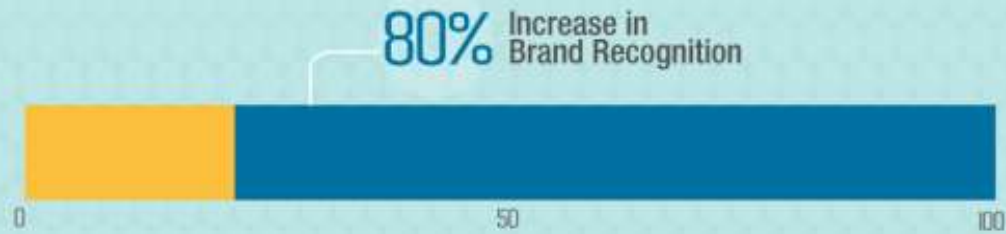
- 85% of shoppers place color as a primary reason for why they buy a particular product.



Color and Branding



➤ Color increases brand recognition by 80%. Brand recognition directly links to consumer confidence.



COLOR EMOTION GUIDE

<p>OPTIMISM CLARITY WARMTH</p>	
<p>FRIENDLY CHEERFUL CONFIDENCE</p>	
<p>EXCITEMENT YOUTHFUL BOLD</p>	
<p>CREATIVE IMAGINATIVE WISE</p>	
<p>TRUST DEPENDABLE STRENGTH</p>	
<p>PEACEFUL GROWTH HEALTH</p>	
<p>BALANCE NEUTRAL CALM</p>	

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- Quickly pinpoint outliers
- Quickly pinpoint trends across multiple locations or areas
- Can easily be customized by colors and low-to-high or high-to-low configuration

Charge-Off Ratios by Branch (12 Months)

From "ALLL Activity" report, PTMonthly Tab.

Branch #	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Jan-13	Average
1	0.83%	0.49%	0.76%	0.76%	0.74%	0.67%	1.34%	1.26%	0.90%	0.87%	0.99%	0.92%	0.88%
2	0.21%	0.11%	0.05%	0.16%	0.16%	0.17%	0.19%	0.20%	0.21%	0.13%	0.12%	0.12%	0.15%
3	0.27%	0.37%	0.35%	1.28%	1.58%	1.59%	1.64%	2.04%	2.84%	1.91%	1.57%	1.46%	1.41%
4	1.00%	0.90%	0.62%	0.72%	0.56%	0.33%	0.51%	0.44%	0.44%	0.41%	0.42%	0.51%	0.57%
5	0.19%	0.26%	0.48%	0.42%	0.41%	0.57%	0.64%	0.60%	0.42%	0.42%	0.48%	0.33%	0.44%
6	0.86%	0.98%	0.70%	0.79%	0.39%	0.51%	0.51%	0.38%	0.37%	0.38%	1.74%	1.69%	0.78%
7	1.62%	0.41%	0.35%	0.43%	0.27%	0.24%	0.35%	0.52%	0.60%	0.60%	0.70%	0.76%	0.57%
8	0.24%	0.17%	0.57%	0.61%	1.07%	1.13%	1.30%	1.36%	0.97%	1.58%	2.13%	2.15%	1.11%
9	2.75%	2.81%	2.56%	2.35%	2.27%	2.40%	2.28%	2.15%	2.43%	3.19%	3.91%	4.12%	2.77%
10	0.35%	0.21%	0.23%	0.47%	0.42%	0.60%	0.66%	0.58%	0.66%	0.48%	0.45%	0.33%	0.45%
11	0.75%	0.69%	0.74%	0.73%	0.55%	0.45%	0.64%	0.58%	0.70%	0.72%	0.78%	0.49%	0.65%
12	2.94%	3.10%	2.92%	3.41%	3.65%	2.80%	3.16%	4.29%	4.65%	5.14%	4.95%	5.63%	3.89%
13	0.00%	0.44%	0.34%	0.66%	0.70%	1.27%	1.46%	1.93%	2.00%	1.75%	1.77%	1.25%	1.13%
14	0.53%	0.59%	0.52%	0.62%	0.65%	0.42%	0.38%	0.30%	0.32%	0.15%	0.12%	0.51%	0.43%
15	0.09%	0.21%	0.34%	0.45%	0.62%	1.00%	1.72%	1.80%	1.73%	1.76%	2.13%	1.73%	1.13%
16	0.82%	1.07%	1.73%	1.73%	1.68%	1.94%	1.99%	1.78%	0.96%	1.16%	1.45%	1.07%	1.45%
17	3.29%	1.70%	1.57%	1.34%	1.21%	0.58%	0.32%	0.62%	0.59%	0.36%	0.46%	0.49%	1.05%
18	0.90%	0.67%	0.66%	0.62%	0.55%	0.63%	0.51%	0.45%	0.40%	0.39%	0.67%	0.55%	0.58%
19	0.48%	0.45%	0.04%	0.04%	0.01%	0.01%	0.01%	0.01%	-0.01%	-0.02%	-0.01%	-0.01%	0.08%
20	1.15%	1.11%	1.02%	1.76%	1.41%	1.53%	1.57%	1.59%	1.85%	1.18%	1.30%	1.40%	1.41%

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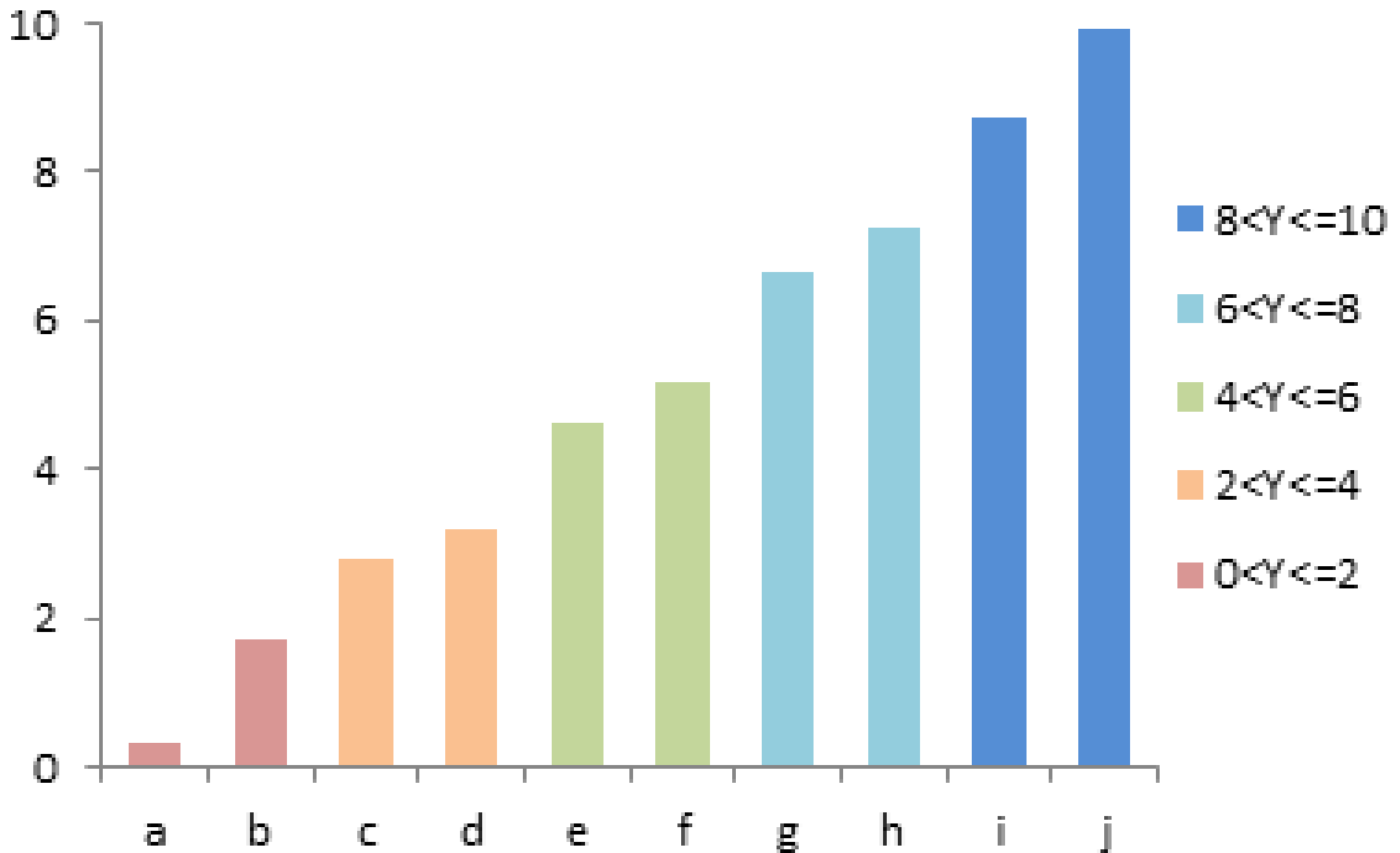
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- Can easily be customized by colors and low-to-high or high-to-low configuration
- Can set threshold with static or dynamic amounts or in tiers (e.g., top 10 percent by amount)
- Can be added to charts and pivot tables
- Check out the tutorial at this link:
<http://peltiertech.com/WordPress/conditional-formatting-of-excel-charts/>

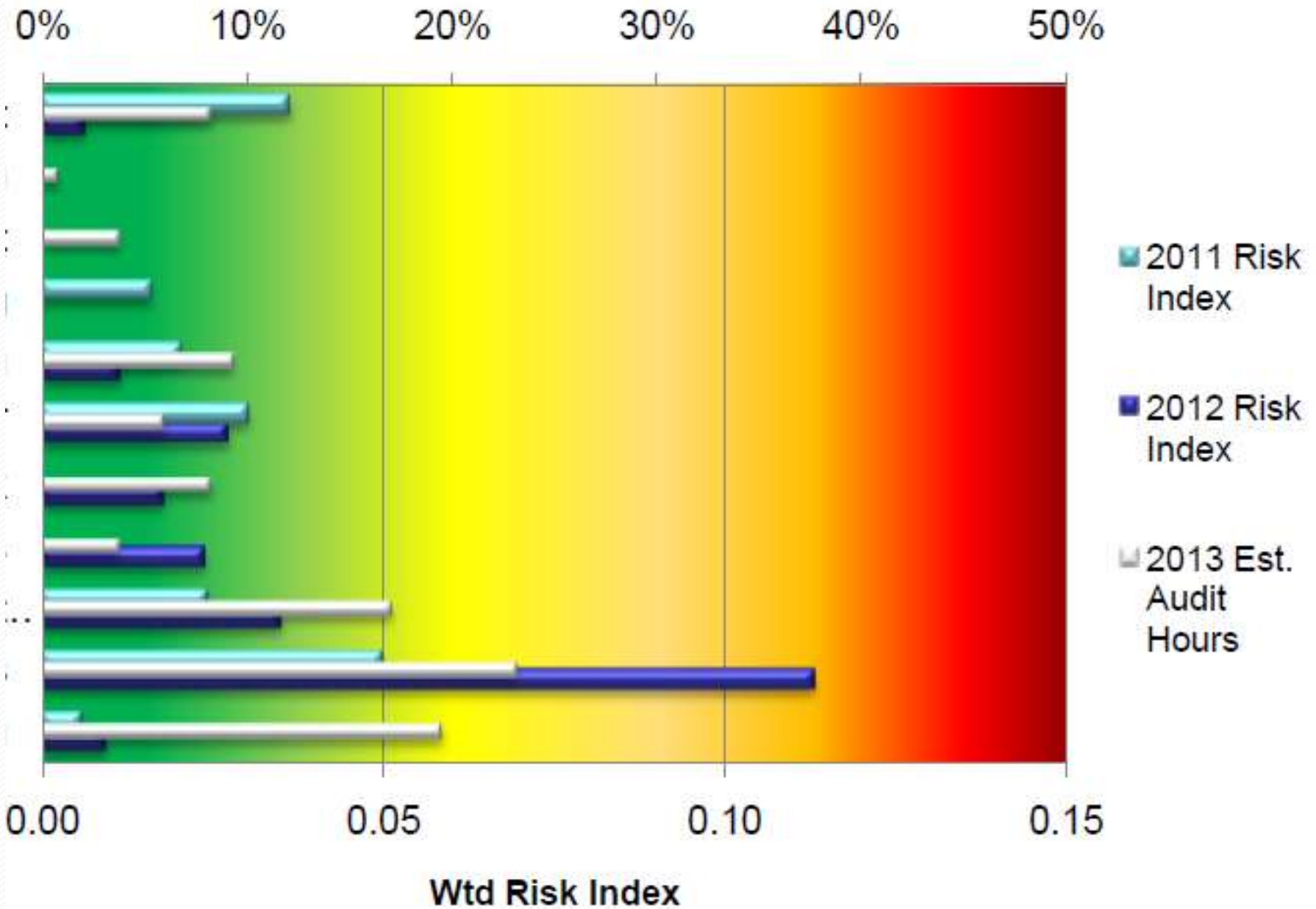
6247	2	225.93
6466	1	15,100.00
6523	6	435.00
7279	1	60.00
7810	2	1,045.74
8293	2	200.00
8485	2	267.00
8758	2	892.32
9028	1	225.00
9130	1	1,527.09
9136	1	30.00
0015	2	140.00
0282	3	145.00
0651	2	25.00
1167	9	2,185.52
1215	2	130.00
1254	1	650.00
1782	3	33,205.55
2349	1	130.00
2928	2	170.00
4677	2	2,450.00
5100	2	3,244.65
5883	3	4,752.90
6312	1	150.00
6684	2	400.00

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Conditional Chart



2013 Est. Audit Hrs



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- Can be added to charts and pivot tables
- Can be formula- (static) or cell-based (dynamic)

Month-to-Month Change

Significant Changes in Assets/Liabilities and Changes in Income/Expenses are highlighted in **ORANGE**.

34,000,000

1,100,000

0.5%

	Change From Feb 2012 to Mar 2012	Change From Mar 2012 to Apr 2012	Change From Apr 2012 to May 2012	Change From May 2012 to Jun 2012	Change From Jun 2012 to Jul 2012	Change From Jul 2012 to Aug 2012	Change From Aug 2012 to Sep 2012	Change From Sep 2012 to Oct 2012	Change From Oct 2012 to Nov 2012	Change From Nov 2012 to Dec 2012	Change From Dec 2012 to Jan 2013
1	799,317	44,919,582	16,010,927	7,083,967	8,814,166	15,048,960	(4,198,016)	32,544,240	(27,430,609)	23,301,576	2,274,166
2	2,134,670	(5,608,230)	(1,801,273)	(7,539,517)	(943,704)	5,306,739	2,766,700	4,530,559	6,277,188	3,129,256	(3,929,449)
3	2,933,987	39,311,351	14,209,654	(455,550)	7,870,461	20,355,699	(1,431,316)	37,074,799	(21,153,420)	26,430,833	(1,655,284)
4	791,483	(548)	955,620	888,960	563,077	632,719	620,635	1,570,316	(176,730)	(211,445)	60,698
5	88,546,382	(6,548,208)	(5,954,938)	36,803,942	(21,243,926)	28,307,806	(1,370,909)	(42,104)	746,809	29,891,690	(10,647,917)
6	(461,546)	(287,003)	(390,589)	9,643,802	(373,646)	12,036,635	9,593,103	(6,714,742)	(344,084)	15,859,073	18,737,280
7	14,550,971	(18,936,128)	9,985,890	6,198,629	3,417,432	5,939,544	9,845,667	(13,921,411)	26,358,047	(29,784,412)	(13,945,704)
8	(952,612)	(27,502)	509,234	(30,758)	(27,270)	(28,454)	(28,606)	(28,635)	(353,789)	(28,188)	(456,281)
9	(402,991)	661,200	(902,748)	347,579	2,221,016	826,675	1,729,827	687,584	824,952	1,015,419	(138,166)
10	836,720	556,373	819,724	2,560,740	206,396	538,606	(194,500)	291,129	(177,279)	116,588	(442,203)
11	47,373	(408,930)	(1,198,620)	(872,375)	(376,791)	(53,750)	(361,676)	(946,250)	(1,000,878)	(2,115,325)	(36,762)
12	47,467	(258,755)	153,036	(210,334)	228,627	(4,590)	285,289	5,885,725	(6,522,473)	(210,827)	387,691
13	(941,716)	3,116,836	(2,152,926)	1,138,148	(410,160)	(606,860)	(14,428)	3,343,491	(106,750)	2,610,387	(1,346,950)
14	104,995,519	17,178,687	16,033,338	56,012,784	(7,924,782)	67,944,030	18,673,084	27,199,902	(1,905,596)	43,573,793	(9,483,598)

Month-to-Month Change

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24,000,000

1,100,000

0.5%

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- Can be added to charts and pivot tables
- Can be formula- (static) or cell-based (dynamic)
- **Can be used to detect duplicate or unique values in dataset**

112572	24,391.03
112573	5,959.83
112574	8,746.61
112575	13,807.87
112576	3,509.97
112577	5,695.19
112578	5,251.23
112578	7,491.38
112579	11,785.14
112580	32,671.57
112581	25,792.63
112582	355.57
112583	14,540.87
112584	454.54
112585	14,239.61
112586	1,921.65
112587	4,858.36
112588	9,130.14
112589	1,062.31
112590	8,375.40
112591	13,821.14

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112587	4,858.36
112588	9,130.14
112589	1,062.31
112590	8,375.40
112591	13,821.14

How can I use subtotals?

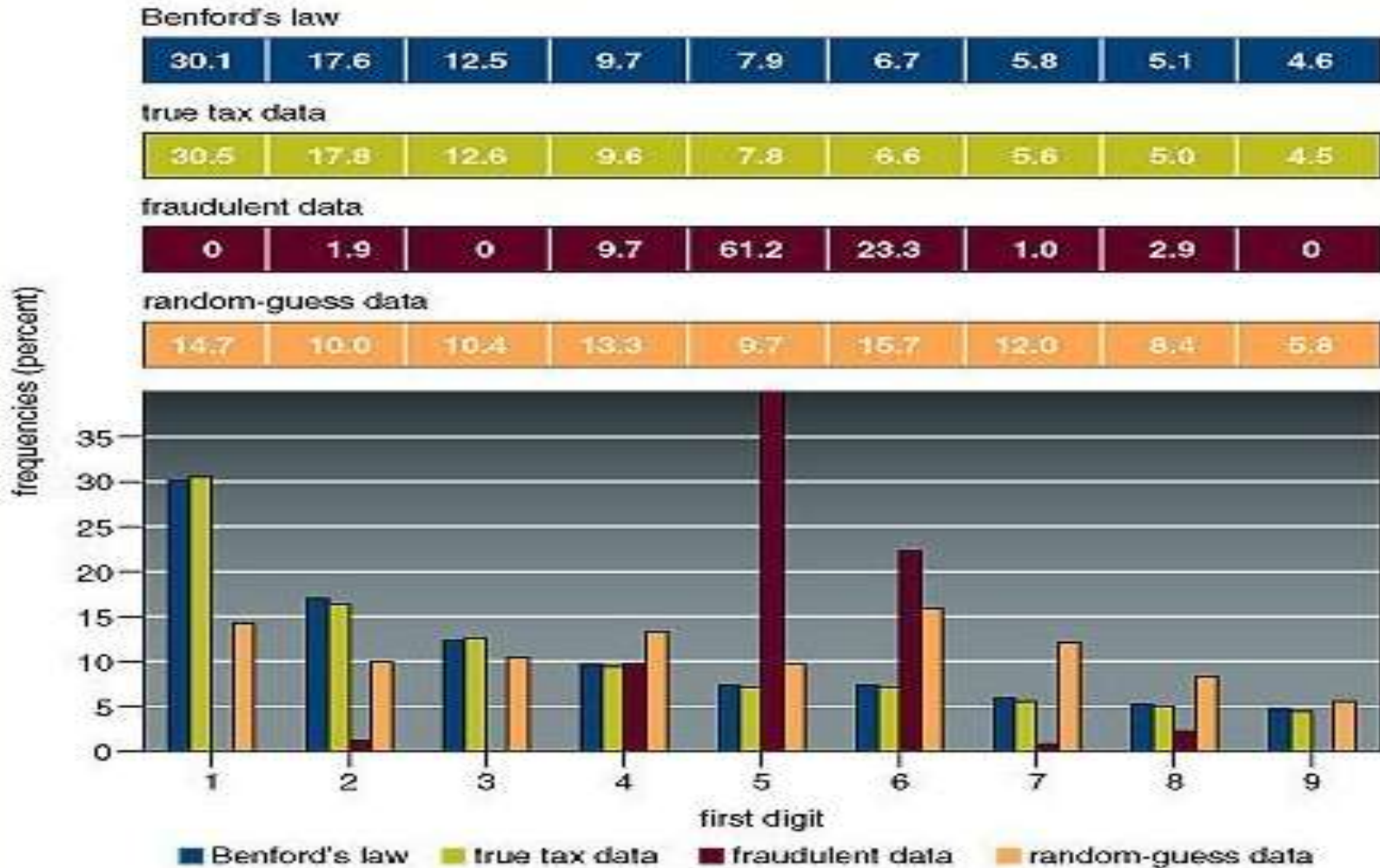
- Use them to replace advanced filters for sum by specific filter or filters (does not completely replace advanced filters)
- Can also be used to do the following functions on filtered data:
 - Sum
 - Average
 - Count
 - Standard deviation
- Can complement PivotTables (those pesky page filters)

What is Benford's Law?

- 1938 (or 47 B.E.)
- Dr. Frank Benford—GE physicist
- Observing worn pages



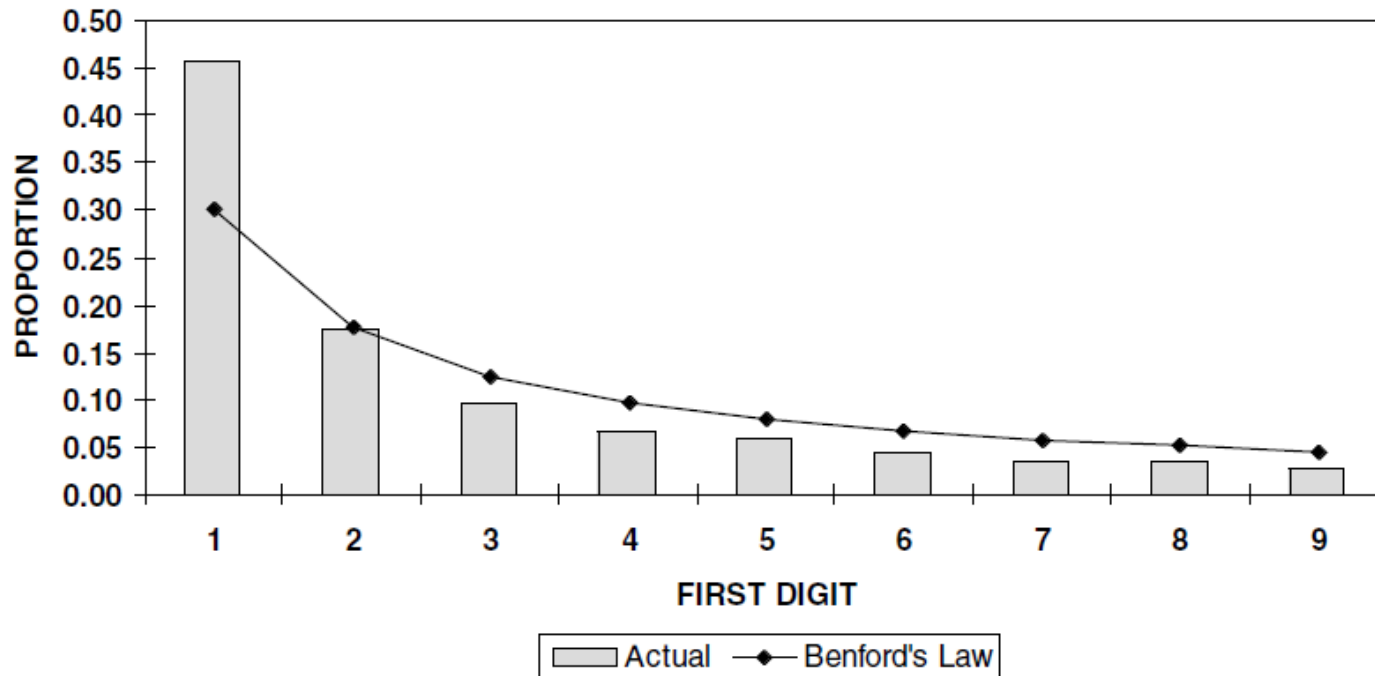
So...How Is It Practical???



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“Looking Out For #1”

Figure 2
Insurance Refund Check Amounts
FIRST DIGIT DISTRIBUTION



So...What Does This Story Teach Us?

- Benford's Law can be an extremely helpful tool
- However, it won't do all the work for you!
- Trust, but verify!!!

When It Works...

- Set of numbers that result from mathematical combination:
 - Good for A/R or A/P ($\# * \text{price}$)
- Transaction-level data
 - Disbursements, sales, expenses
- Must be a 'large enough' set of data
- Should be entire data set, not just sample

When It Doesn't...

- Any data set that conforms to predetermined or assigned numbers:
 - Check #'s or PO #'s
- Numbers influenced by human thought:
 - \$1.99 vs \$2.00
- Accounts with built-in max or min:
 - Assets that must meet a threshold to be recorded
- Unrecorded transactions

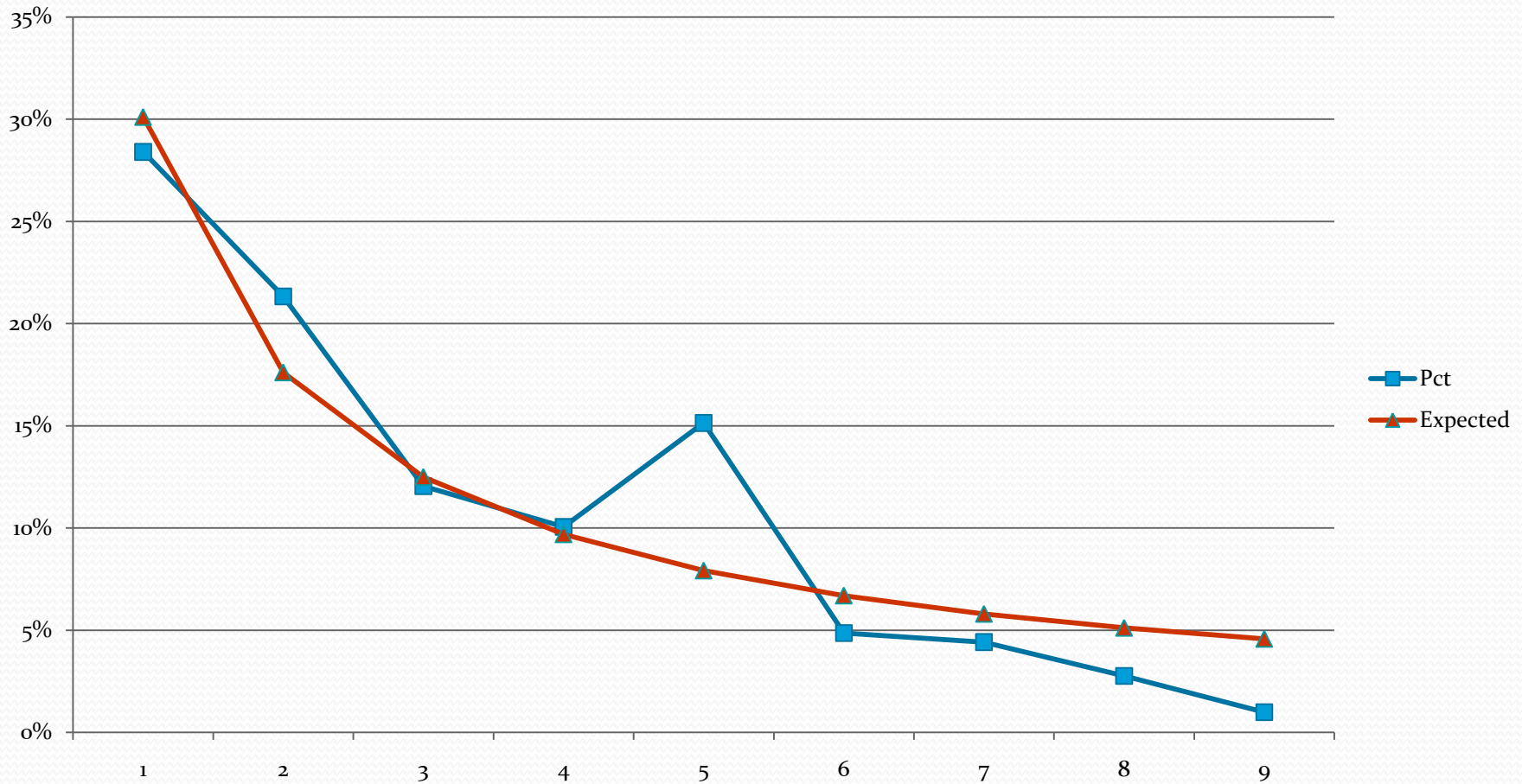
So...Can Excel Do Benford?

- Of course!
- Simple three-step process
- Step 1: Extract the first digit of the #s in your data set.
 - Can generally be done in several ways, I like to use the 'LEFT()' formula
- Step 2: Calculate frequency of first digit occurrence in data set.
 - I like to use the 'COUNTIF()' formula
- Step 3: Calculate expected frequency using Benford's Formula
 - $\text{Log}(1+1/d_1)$, where d_1 represents the first digit of a number
- Step 4: Chart the results using a line or column graph.

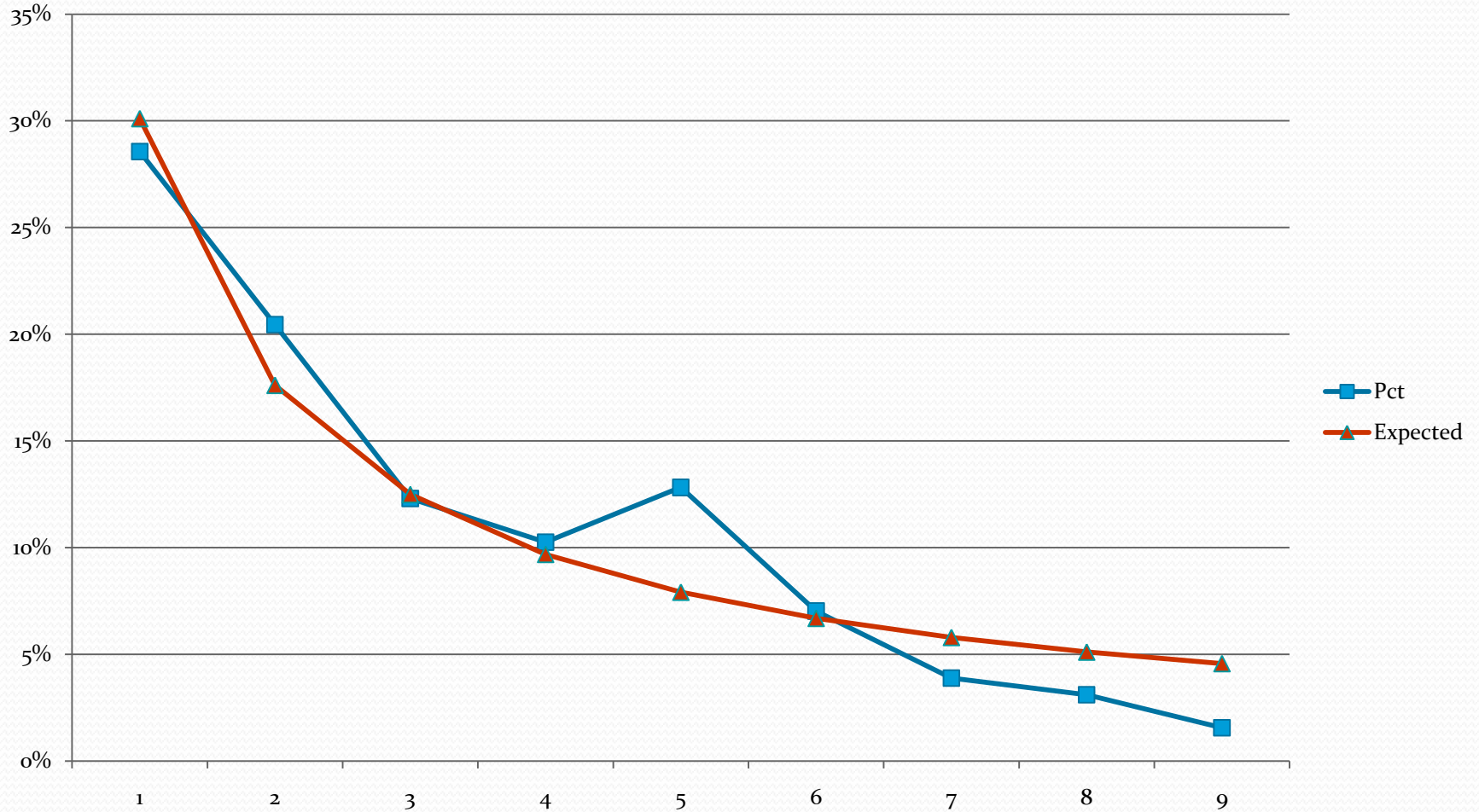
Application—The Suspect Teller

First Digit	Frequency	Pct	Benford
1	257	28%	30%
2	193	21%	18%
3	109	12%	12%
4	91	10%	10%
5	137	15%	8%
6	44	5%	7%
7	40	4%	6%
8	25	3%	5%
9	9	1%	5%

Application—The Suspect Teller



Application—All Tellers



Limitations of Benford's Law

- Determining what is 'significant' deviation
- Extracting legitimate, non-conforming data (see example)
- Should be seen as complimentary, rather than primary, tool

What is Regression Analysis?

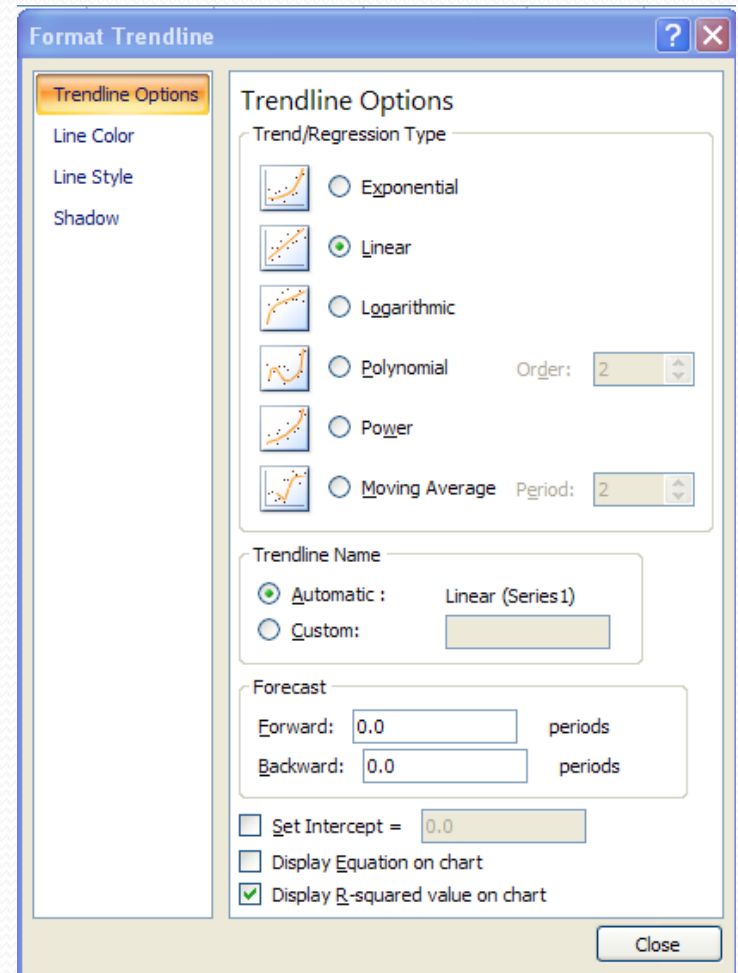
- How does *this* impact *that*?
- Measurement of how well the independent variable explains the dependent variable.
- Two-factor (basic, linear)
- Multi-factor (advanced)
- R^2 score measures the relationship.

So...How Is It Practical???

- Loan volume to commissions
- Products sold to commissions
- Products sold to cost of goods sold
- Revenue to cost of goods sold
- Weighted average rate of new loans booked to calculated portfolio yield

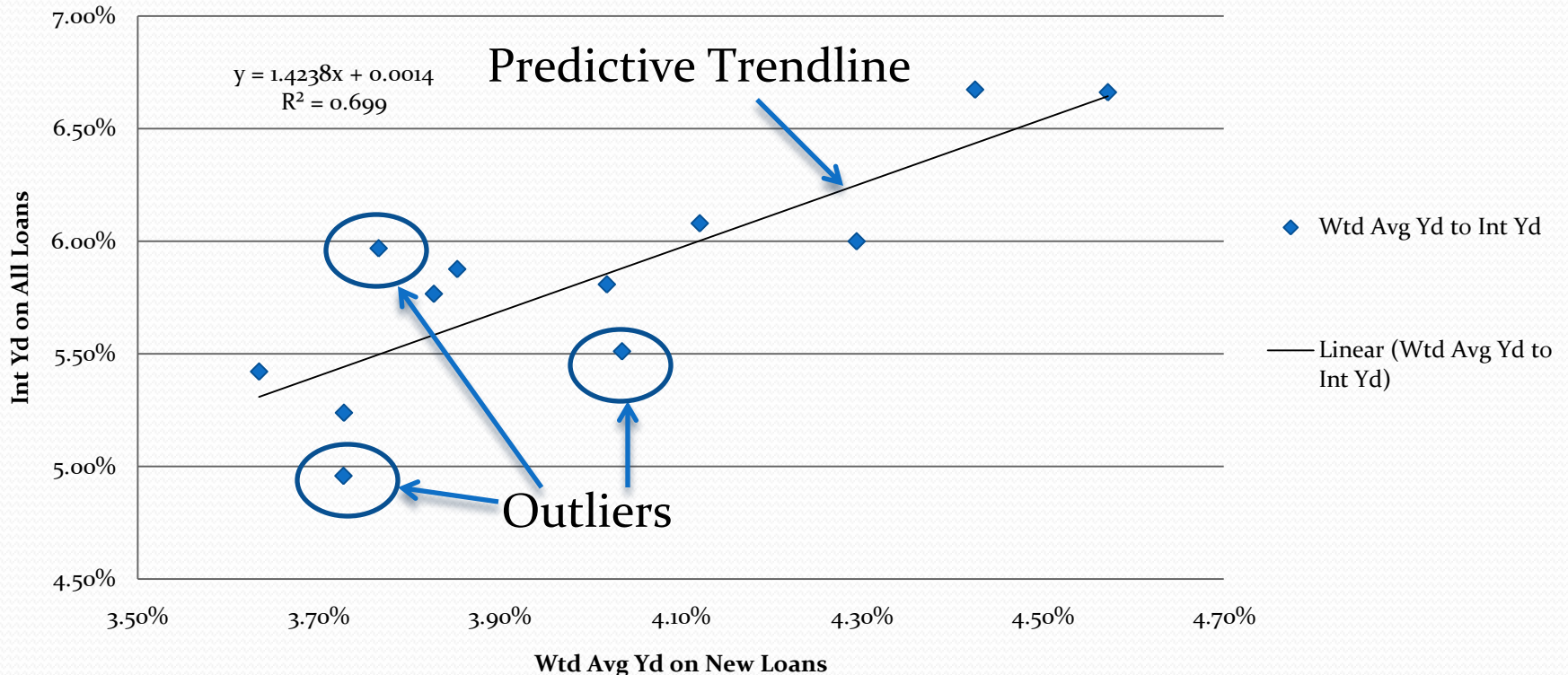
So...Can Excel Do Regression?

- Of course!
- **Step 1:** Organize data
- **Step 2:** Create scatter graph
- **Step 3:** Add trendline
 - Select data points on chart
 - Right-click
 - Select 'Add Trendline'
 - Make sure 'Linear' is selected,
 - Check the 'Display R-squared value on chart' box



So...Can Excel Do Regression?

New Auto Loan Interest Regression



Limitations of Regression Analysis

- Determining what a 'good' R^2 number is:
 - '1' is perfectly positively correlated
 - '0' is no relationship
 - '-1' is perfectly inversely correlated
 - Your analysis will be somewhere in between 99.999% of the time!
- Not useful if more than one significant independent variable is present (multi-factor; but Excel CAN do this, too!)
- Should be seen as complimentary, rather than primary, tool

What is 'INDEX...MATCH'?

- Do you remember arrays and matrices in math class?
- Neither do I...but Excel does!
- This function creates arrays to allow comparison of unlimited fields* between two or more different data sets

*Limited by your CPU and RAM, *might* be limited to 27 matches, but I haven't tried**

**Although it is on my New Year's resolution list

So...How Is It Practical???

- Data sets with no 'unique' or 'primary' key
 - No account number
- Data with more than one record per for each primary key
 - Same account number on different records
- Amounts, dates, last names

1	29998.8	#N/A	
1	340	#N/A	
1	581	#N/A	
1	20	#N/A	
4	80	#N/A	
5	100	#N/A	
3	60	#N/A	
1	20	#N/A	
6	4568.15	#N/A	
1	20	#N/A	
6	120	#N/A	
8	160	#N/A	
2	710.22	#N/A	
1	1115	#N/A	
3	925	████████5894	Initial Deposit
3	10860.19	#N/A	
3	1300	████████7556	Initial Deposit
1	25	████████0622	Initial Deposit
1	25	████████0646	Initial Deposit

So...How Do I Do It in Excel???

- Step 1: Identify common fields to match.
- Step 2: Input formula
 - The formula is a *bit* complicated
 - Read the manual!
- Step 3: Type CTRL+SHIFT+ENTER to designate the formula as an array.



Questions?