Calculation Basics
Advanced Calculations

DAX to the MAXX()

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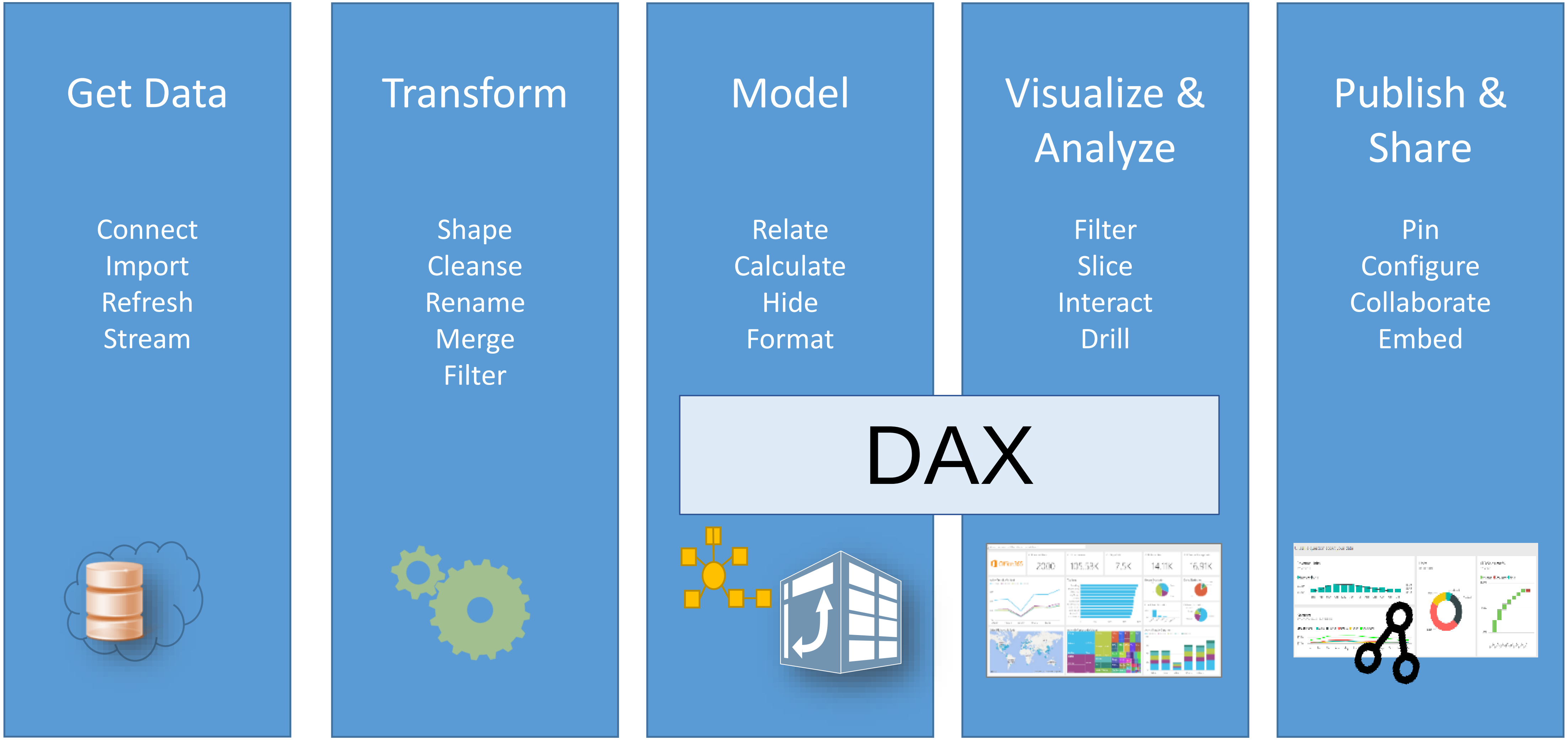
Microsoft® Most Valuable Professional

- Introduction to DAX
- Essential DAX functions
- Calculated columns
- Measures
- Aggregators
- Time intelligence

- DAX function roadmap
- CALCULATE & FILTER functions
- How DAX Processes & Calculates Results
- Dependent measures
- Evolution of a measure
- Modifying Row & Filter context
- When to use iterators
- DAX Studio

Design Phases



Get Data

Connect
Import
Refresh
Stream

Transform

Shape
Cleanse
Rename
Merge
Filter

Model

Relate
Calculate
Hide
Format

Visualize & Analyze

Filter
Slice
Interact
Drill

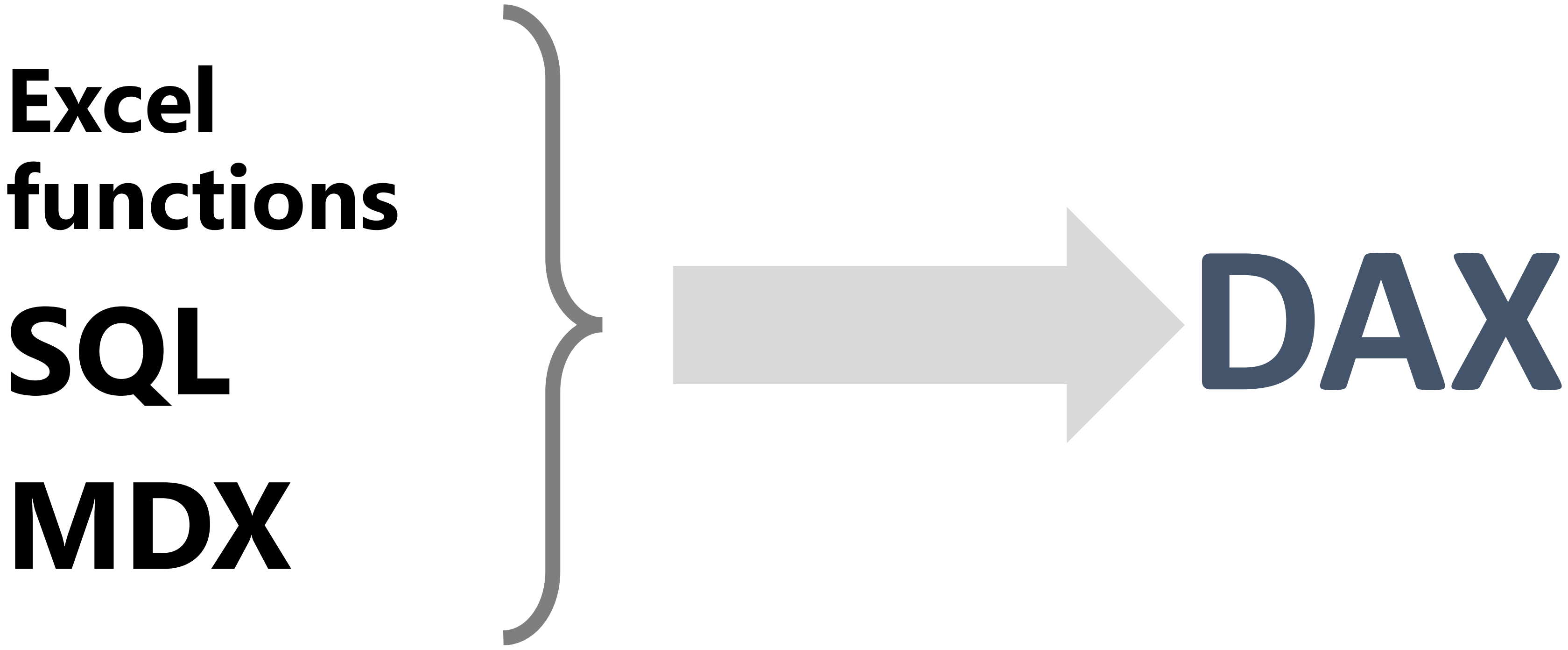
Publish & Share

Pin
Configure
Collaborate
Embed

DAX

What is DAX and Where Did it Come From?

1. Expression language, used to perform calculations in:
   - Power Pivot
   - Power BI
   - SQL Server Analysis Service (SSAS) Tabular
2. Query language
3. Language elements derived from:



Excel functions

SQL

MDX

DAX

Learning DAX

- Understanding essential concepts is more important than memorizing functions
- You can always lookup function syntax
- Keeping a library of working examples may be more valuable than a web search

ABS
ACOS
ACOSH
ACOT
ACOTH
ADDCOLUMNS
ADDMISSINGITEMS
ALL
ALLEXCEPT
ALLNOBLANKROW
ALLSELECTED
AND
ASIN
ASINH
ATAN
ATANH
AVERAGE
AVERAGEA
AVERAGEX
BETA.DIST
BETA.INV
BLANK
CALCULATE
CALCULATETABLE
CALENDAR
CALENDARAUTO
CEILING
CHISQ.DIST
CHISQ.DIST.RT
CHISQ.INV
CHISQ.INV.RT
CLOSINGBALANCEMONTH
CLOSINGBALANCEQUARTER
CLOSINGBALANCEYEAR
COMBIN
COMBINA
CONCATENATE
CONCATENATEX
CONFIDENCE.NORM
CONFIDENCE.T
CONTAINS
COS
COSH
COT
COTH
COUNT
COUNTA
COUNTAX
COUNTBLANK
COUNTROWS
COUNTX
CROSSFILTER
CROSSJOIN
CURRENCY
CURRENTGROUP
CUSTOMDATA
DATATABLE
DATE
DATEADD
DATEDIFF
DATESBETWEEN
DATESINPERIOD

DATESMTD
DATESQTD
DATESYTD
DATEVALUE
DAY
DEGREES
DISTINCT
DISTINCTCOUNT
DIVIDE
EARLIER
EARLIEST
EDATE
ENDOFMONTH
ENDOFQUARTER
ENDOFYEAR
EOMONTH
EVEN
EXACT
EXCEPT
EXP
EXPON.DIST
FACT
FILTER
FILTERS
FIND
FIRSTDATE
FIRSTNONBLANK
FIXED
FLOOR
FORMAT
GCD
GENERATE
GENERATEALL
GEOMEAN
GEOMEANX
GROUPBY
HASONEFILTER
HASONEVALUE
HOUR
IF
IFERROR
IGNORE
INT
INTERSECT
ISBLANK
ISCROSSFILTERED
ISEMPTY
ISERROR
ISEVEN
ISFILTERED
ISLOGICAL
ISNONTEXT
ISNUMBER
ISO.CEILING
ISODD
ISONORAFTER
ISSUBTOTAL
ISTEXT
KEEPFILTERS
LASTDATE
LASTNONBLANK
LCM

LEFT
LEN
LN
LOG
LOG10
LOOKUPVALUE
LOWER
MAX
MAXA
MAXX
MEDIAN
MEDIANX
MID
MIN
MINA
MINUTE
MINX
MOD
MONTH
MROUND
NATURALINNERJOIN
NATURALLEFTOUTERJOIN
NEXTDAY
NEXTMONTH
NEXTQUARTER
NEXTYEAR
NOT
NOW
ODD
OPENINGBALANCEMONTH
OPENINGBALANCEQUARTER
OPENINGBALANCEYEAR
OR
PARALLELPERIOD
PATH
PATHCONTAINS
PATHITEM
PATHITEMREVERSE
PATHLENGTH
PERCENTILE.EXC
PERCENTILE.INC
PERCENTILEX.EXC
PERCENTILEX.INC
PERMUT
PI
POISSON.DIST
POWER
PREVIOUSDAY
PREVIOUSMONTH
PREVIOUSQUARTER
PREVIOUSYEAR
PRODUCT
PRODUCTX
QUOTIENT
RADIANS
RAND
RANDBETWEEN
RANK.EQ
RANKX
RELATED
RELATEDTABLE
REPLACE

REPT
RIGHT
ROLLUP
ROLLUPADDISSUBTOTAL
ROLLUPGROUP
ROLLUPISSUBTOTAL
ROUND
ROUNDDOWN
ROUNDUP
ROW
SAMEPERIODLASTYEAR
SAMPLE
SEARCH
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SELECTCOLUMNS
SIGN
SIN
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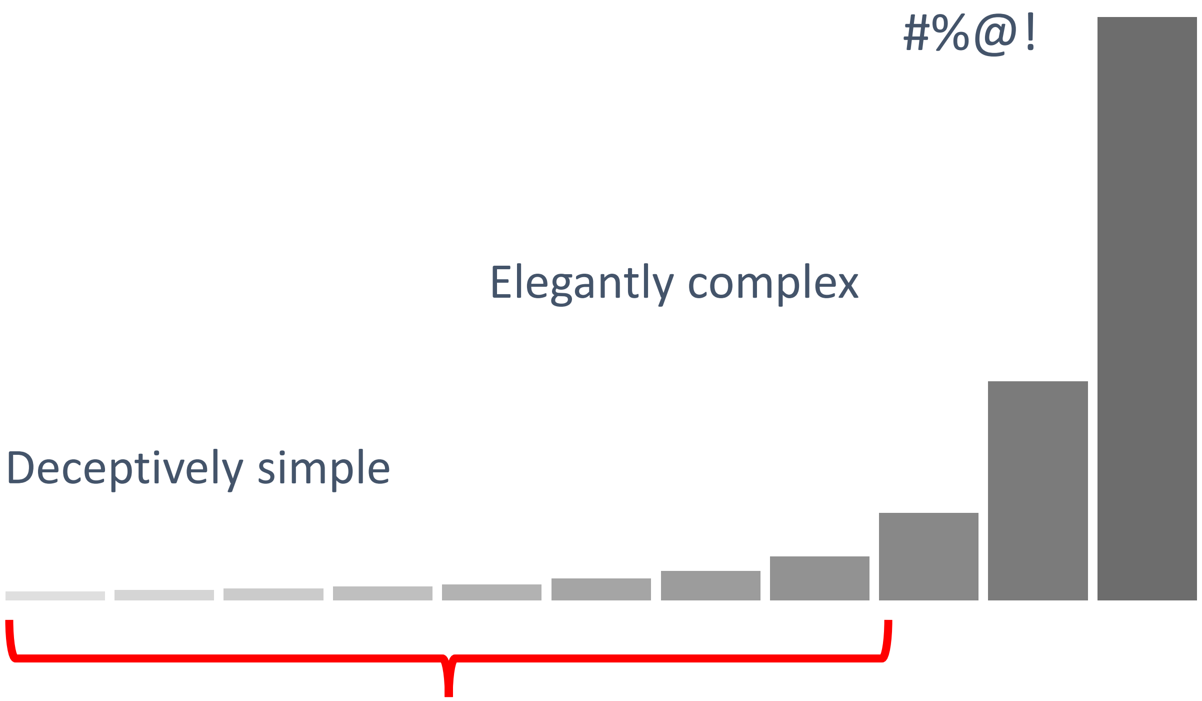
SQRT
SQRTPI
STARTOFMONTH
STARTOFQUARTER
STARTOFYEAR
STDEV.P
STDEV.S
STDEVX.P
STDEVX.S
SUBSTITUTE
SUBSTITUTEWITHINDEX
SUM
SUMMARIZE
SUMMARIZECOLUMNS
SUMX
SWITCH
TAN
TANH
TIME
TIMEVALUE
TODAY
TOPN
TOTALMTD
TOTALQTD
TOTALYTD
TRIM
TRUNC
UNICODE
UNION
UPPER
USERELATIONSHIP
USERNAME
VALUE
VALUES
VAR.P
VAR.S
VARX.P
VARX.S
WEEKDAY
WEEKNUM
XIRR
XNPV
YEAR
YEARFRAC

DAX Learning Curve



#%@!

Elegantly complex

Deceptively simple

Most calculations

What to Learn

Examples of some important DAX functions & concepts
Beyond the basics, specific functions are useful in different business scenarios
There or than 250 DAX functions and more added with each major release

PERCENTILE()
ISERROR()
RANKX()
RELATEDTABLE()
ALL()
EARLIER()
CALCULATETABLE()
IF()
SUM()
ALLSELECTED()
CONTAINS()
SUMX()
SWITCH()
ISBLANK()
EVALUATE
DATEDIFF()
ROW()
MEASURES
DATE()
TIME()
VALUES()
NOW()
DATESINPERIOD()
CALCULATED COLUMNS
EOMONTH()
CALCULATE()
HASONEVALUE()
PERVIOUSMONTH()
TODAY()
DIVIDE()
FILTER()
SUMMARIZE()
FIRSTNONBLANK()
TOTALMTD()
SAMEPERIODLASTYEAR()
DATESMTD()

Important Concepts

- Row context
- Filter context
- Filter propagation
- Aggregators
- Iterators

- Calculated columns
- Measures

Context

Webster:

"The interrelated conditions in which something exists or occurs"

Turley:

"Where the heck am I?"…

…"and how did I get here?"

Row Context:

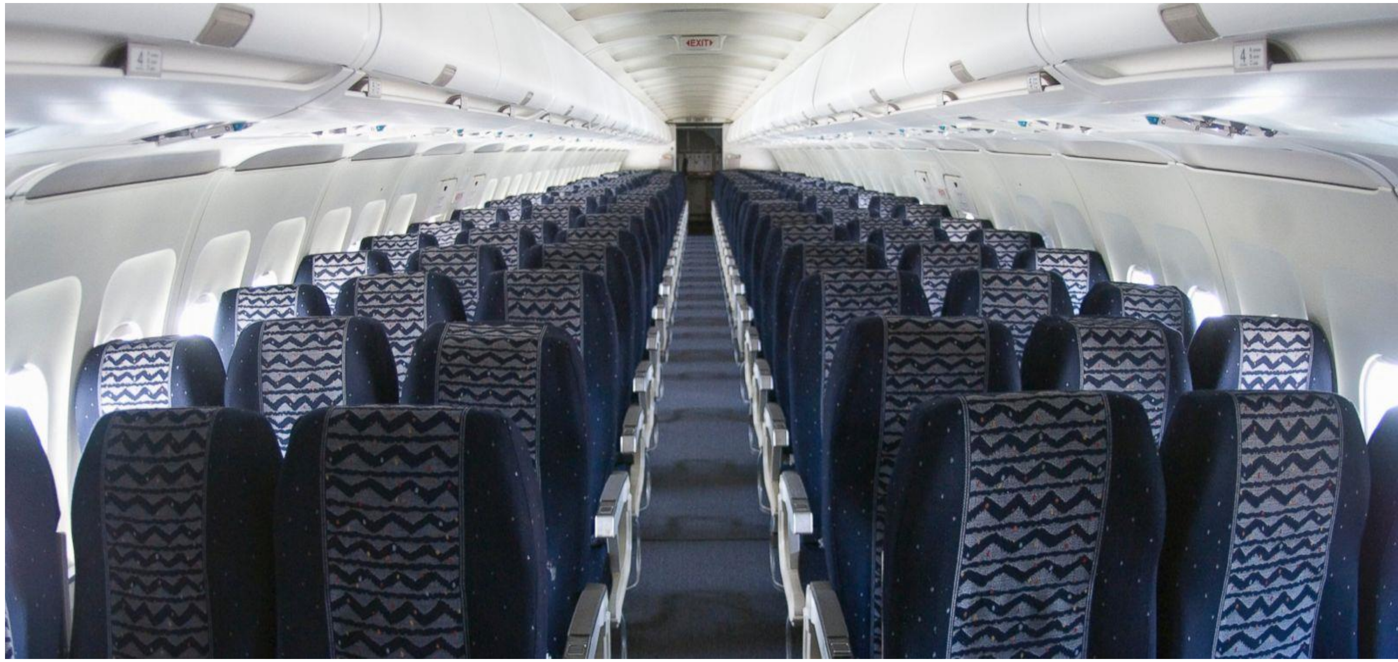
"What row am I on?"

Filter Context:

"What filters are applied?"

-1st Class, Bus. Class or Economy

-Window, isle or middle seat



Implicit & Explicit Measures

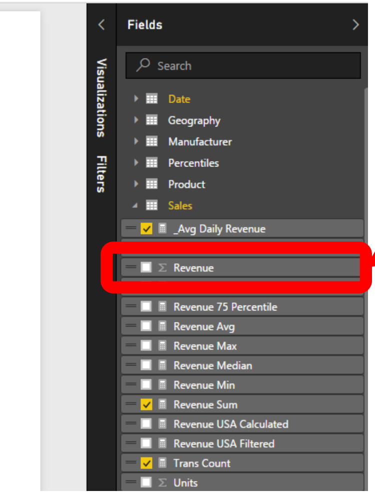
No one right answer

Two schools of thought:

1. **Power BI should behave like Excel**
   - Excel uses implicit measures with workbook data
   - PivotTables & charts:
     - SUM numbers by default
     - COUNT text by default
   - Power BI Desktop: numeric columns have Summarize By property
2. **All measures should be explicitly defined**
   - Model designer maintains control
   - Default behavior may not always be right

Excel doesn't support Power BI Implicit measures

Power BI Report



Fields

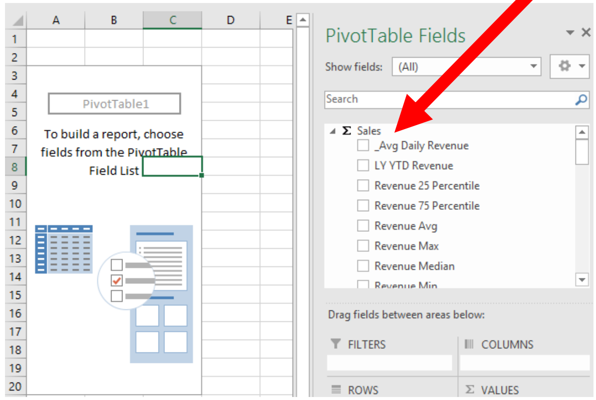
Search

- Date
- Geography
- Manufacturer
- Percentiles
- Product
- Sales

☑ _Avg Daily Revenue
☐ Σ Revenue
☐ Revenue 75 Percentile
☐ Revenue Avg
☐ Revenue Max
☐ Revenue Median
☐ Revenue Min
☑ Revenue Sum
☐ Revenue USA Calculated
☐ Revenue USA Filtered
☑ Trans Count
☐ Σ Units

Implicit measure (numeric column)

Excel Pivot Table



PivotTable1

To build a report, choose fields from the PivotTable Field List

PivotTable Fields

Show fields: (All)

Search

Σ Sales
☐ _Avg Daily Revenue
☐ LY YTD Revenue
☐ Revenue 25 Percentile
☐ Revenue 75 Percentile
☐ Revenue Avg
☐ Revenue Max
☐ Revenue Median
☐ Revenue Min

Drag fields between areas below:

No Implicit measure

Recommended DAX Tools

Power BI Desktop /Excel 2013+

- Power BI Desktop
- Excel
- DAX Studio

SSAS Tabular

- SSDT for Visual Studio 2015+
- SSMS
- Excel
- DAX Studio

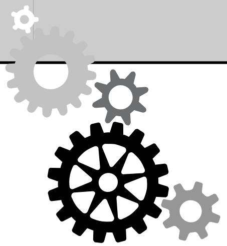
Excel 2010/SSAS 2012, 2014

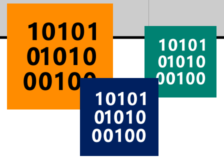
- NotePad++
- DAX Studio
- DAXFormatter.com

DAX Function Roadmap

	Date & Time	Time Intelligence	Filter	Information	Logical	Math	Statistical

Some examples	DATE()
	TIME()
	TODAY()
	NOW()
	DATEDIFF()
	EOMONTH()
		DATESMTD()
		TOTALMTD()
		PERVIOUSMONTH()
		SAMEPERIODLASTYEAR()
		DATESINPERIOD()
			FILTER()
			VALUES()
			ALL()
			CALCULATE()
				ISBLANK()
				ISERROR()
				CONTAINS()
				HASONEVALUE()
					IF()
					AND, &&, AND()
					OR, ||, OR()
					SWITCH()
					TRUE()
						SUM()
						AVERAGE()
						DIVIDE()
							SUMX()
							AVERAGEX()
							RANKX()
							PERCENTILE()





Important concepts

DAX query engine flow:

- Get report filter context
- Apply CALCULATE() filters
- Apply dimension table filter context
- Filter fact table using relationships
- Perform math & calculations

Context:

- Evaluation…
- Filter…
- Row…
- Context transition

Measures:

- Majority of all calculations
- Can have implicit or explicit filter context
- Can override natural filter behavior

Calculated Columns:

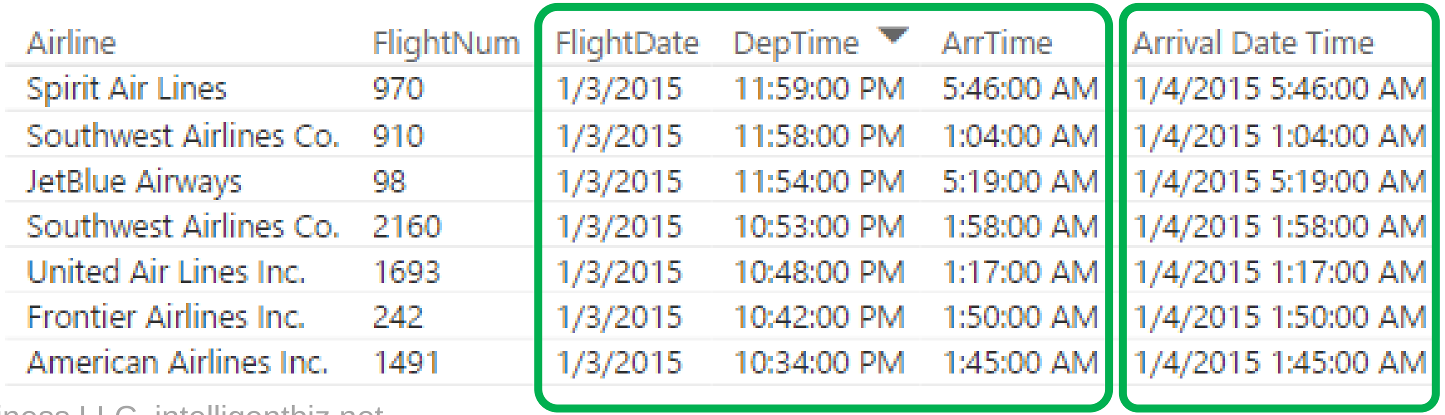
- Good for banding
- Built-in row context
- Using measures in calc. columns will ignore row context

Calculated Columns

- Typically used in the context of a single row
- May be used as intermediate calculations to support measures

```
Arrival Date Time =
    IF( [ArrTime] < [DepTime],
            [FlightDate] + 1,
            [FlightDate]
    ) + [ArrTime]
```

This calculated column combines the flight ***date*** and arrival ***time*** values needed by measure calculations. It adds one day if the arrival time is earlier than the departure time because the flight landed the next day (after midnight)



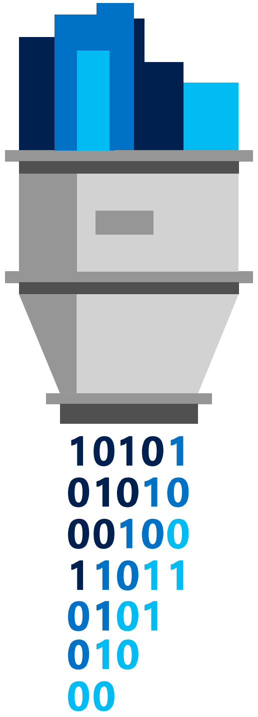
Airline	FlightNum	FlightDate	DepTime	ArrTime	Arrival Date Time
Spirit Air Lines	970	1/3/2015	11:59:00 PM	5:46:00 AM	1/4/2015 5:46:00 AM
Southwest Airlines Co.	910	1/3/2015	11:58:00 PM	1:04:00 AM	1/4/2015 1:04:00 AM
JetBlue Airways	98	1/3/2015	11:54:00 PM	5:19:00 AM	1/4/2015 5:19:00 AM
Southwest Airlines Co.	2160	1/3/2015	10:53:00 PM	1:58:00 AM	1/4/2015 1:58:00 AM
United Air Lines Inc.	1693	1/3/2015	10:48:00 PM	1:17:00 AM	1/4/2015 1:17:00 AM
Frontier Airlines Inc.	242	1/3/2015	10:42:00 PM	1:50:00 AM	1/4/2015 1:50:00 AM
American Airlines Inc.	1491	1/3/2015	10:34:00 PM	1:45:00 AM	1/4/2015 1:45:00 AM

Measure Calculations

- Understanding context
  - Row context
  - Filter context
  - Context switching
- The CALCULATE function revisited
- How DAX processes & calculates results
- Maintaining a development, testing and learning environment

CALCULATE function

revisited



CALCULATE(<expression>, <filter1>, <filter2>)

Means: “Go apply filters”

Similar in concept to ***Where*** in TSQL

```
Avg Weath Delay for bad weather days =
 CALCULATE(
   AVERAGE( [Weather Delay] ),
   'Airline Performance'[WeatherDelay] > 0
 )
```

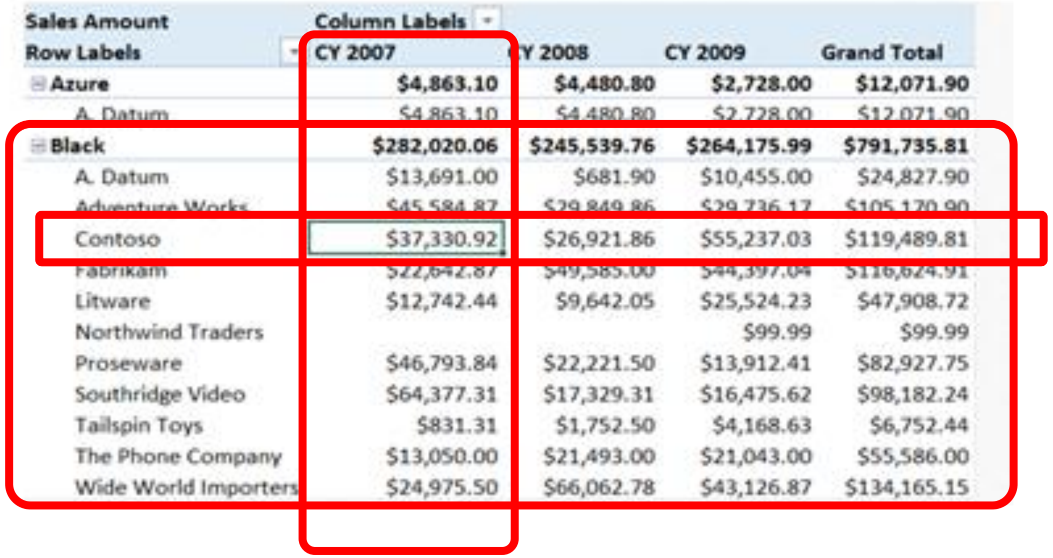
This measure calculates the average Weather Delay only for those flights where there was a delay (over 0 minutes)

How DAX Processes & Calculates Results

1. **Get Row & Filter Context from report visual (or Pivot Table here)**
2. **Adjust the Filter Context based on CALCULATE() parameters**

   (if CALCULATE is part of the function)
3. **Filter the related lookup tables**
4. **Pass those filters along to the Fact table**
5. **Output a subset of rows**
6. **Do the math**

Excel example:
…based on filters, slicers, rows& columns



Sales Amount	Column Labels			
Row Labels	CY 2007	CY 2008	CY 2009	Grand Total
Azure	**$4,863.10**	**$4,480.80**	**$2,728.00**	**$12,071.90**
A. Datum	$4,863.10	$4,480.80	$2,728.00	$12,071.90
Black	**$282,020.06**	**$245,539.76**	**$264,175.99**	**$791,735.81**
A. Datum	$13,691.00	$681.90	$10,455.00	$24,827.90
Adventure Works	$45,584.87	$29,849.86	$29,736.17	$105,170.90
Contoso	$37,330.92	$26,921.86	$55,237.03	$119,489.81
Fabrikam	$22,642.87	$49,585.00	$44,397.04	$116,624.91
Litware	$12,742.44	$9,642.05	$25,524.23	$47,908.72
Northwind Traders			$99.99	$99.99
Proseware	$46,793.84	$22,221.50	$13,912.41	$82,927.75
Southridge Video	$64,377.31	$17,329.31	$16,475.62	$98,182.24
Tailspin Toys	$831.31	$1,752.50	$4,168.63	$6,752.44
The Phone Company	$13,050.00	$21,493.00	$21,043.00	$55,586.00
Wide World Importers	$24,975.50	$66,062.78	$43,126.87	$134,165.15

Time Intelligence

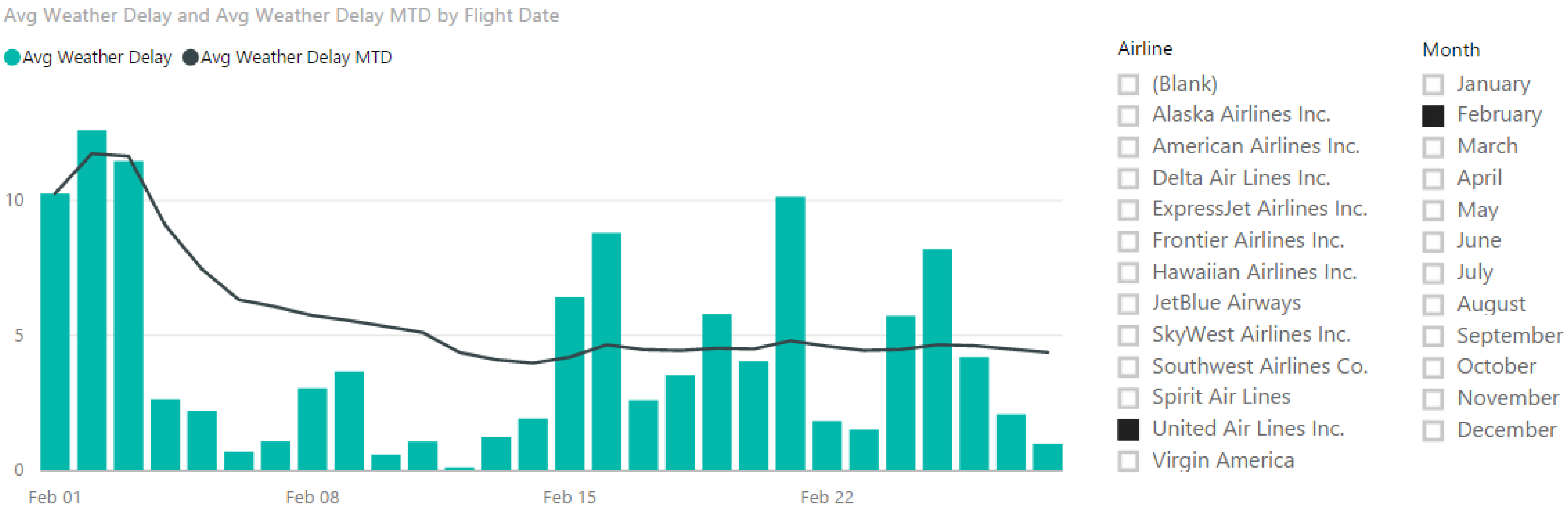
DAX functions

- NOW, DATE, TIME
- DATEADD
- DATEDIFF
- DATESMTD
- DATESBETWEEN
- TOTALMTD …QTD, YTD
- NEXTMONTH …DAY, QUARTER, YEAR
- PARALLELPERIOD

Time Intelligence Example

Month-To-Date Average

```
Avg Weather Delay MTD = CALCULATE( [Avg Weather Delay],
        DATESMTD( 'Flight Date'[Flight Date] ) )
```


Avg Weather Delay and Avg Weather Delay MTD by Flight Date
● Avg Weather Delay ● Avg Weather Delay MTD
10
5
0
Feb 01
Feb 08
Feb 15
Feb 22

Airline

- ☐ (Blank)
- ☐ Alaska Airlines Inc.
- ☐ American Airlines Inc.
- ☐ Delta Air Lines Inc.
- ☐ ExpressJet Airlines Inc.
- ☐ Frontier Airlines Inc.
- ☐ Hawaiian Airlines Inc.
- ☐ JetBlue Airways
- ☐ SkyWest Airlines Inc.
- ☐ Southwest Airlines Co.
- ☐ Spirit Air Lines
- ■ United Air Lines Inc.
- ☐ Virgin America

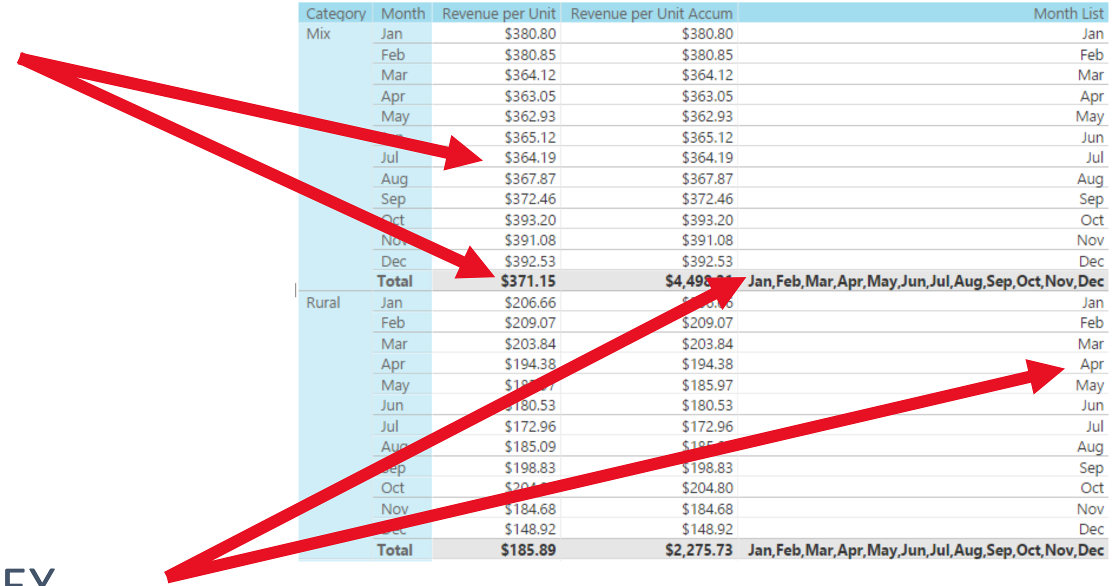
Month

- ☐ January
- ■ February
- ☐ March
- ☐ April
- ☐ May
- ☐ June
- ☐ July
- ☐ August
- ☐ September
- ☐ October
- ☐ November
- ☐ December

Iterator functions

Mixed totals: Operates on one row at a time, accumulating the result of the prior iteration

- SUMX
- AVERAGEX
- MINX
- MAXX
- COUNTX
- COUNTAX
- PRODUCTX
- CONCATENATEX



Category	Month	Revenue per Unit	Revenue per Unit Accum	Month List
Mix	Jan	$380.80	$380.80	Jan
	Feb	$380.85	$380.85	Feb
	Mar	$364.12	$364.12	Mar
	Apr	$363.05	$363.05	Apr
	May	$362.93	$362.93	May
	Jun	$365.12	$365.12	Jun
	Jul	$364.19	$364.19	Jul
	Aug	$367.87	$367.87	Aug
	Sep	$372.46	$372.46	Sep
	Oct	$393.20	$393.20	Oct
	Nov	$391.08	$391.08	Nov
	Dec	$392.53	$392.53	Dec
	Total	**$371.15**	**$4,498.[illegible]**	**Jan,Feb,Mar,Apr,May,Jun,Jul,Aug,Sep,Oct,Nov,Dec**
Rural	Jan	$206.66	$206.66	Jan
	Feb	$209.07	$209.07	Feb
	Mar	$203.84	$203.84	Mar
	Apr	$194.38	$194.38	Apr
	May	$185.97	$185.97	May
	Jun	$180.53	$180.53	Jun
	Jul	$172.96	$172.96	Jul
	Aug	$185.09	$185.09	Aug
	Sep	$198.83	$198.83	Sep
	Oct	$204.80	$204.80	Oct
	Nov	$184.68	$184.68	Nov
	Dec	$148.92	$148.92	Dec
	Total	**$185.89**	**$2,275.73**	**Jan,Feb,Mar,Apr,May,Jun,Jul,Aug,Sep,Oct,Nov,Dec**

Using Iterators

These two different calculation techniques achieve the same result using different formula mechanics:

```
Avg Weather Delay =
    AVERAGEX (
      FILTER ( 'Airline Performance', 'Airline Performance'[WeatherDelay] > 0 ),
      'Airline Performance'[WeatherDelay] )
```

For every row in the 'Airline Performance' table, the FILTER is applied and qualifying values are added to the Average calculation. Although less efficient than the following example, complex operations can be performed within each iteration.

```
Avg Weather Delay =
     CALCULATE(
        [Avg Weather Delay],
        'Airline Performance'[WeatherDelay] > 0 )
```

Dependent Measures

- Measures may be used in other measure calculations
- Measure names must be unique within the model
- Measures contained in any table can be used in any calculation

```
Flights = COUNTROWS( ‘Airline Performance’ )
```

```
All Flights = CALCULATE( [Flights],
                     ALL( 'Airline Performance‘ ) )
```

```
% of Total Flights= DIVIDE( [Flights], [All Flights] )
```

CALCULATE() with FILTER()

- Use FILTER() function for rich filtering

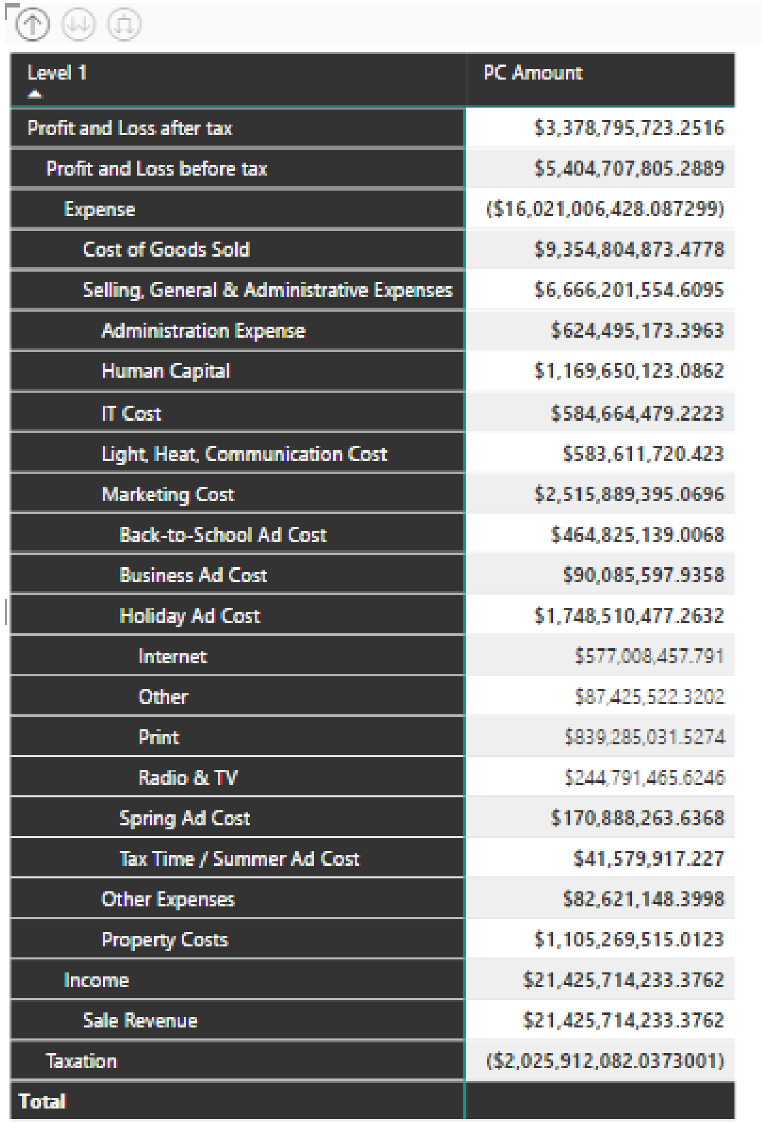
```
Flights Over 15 min = CALCULATE( [Flights],
        FILTER( ‘Airline Performance’, [Avg Weather Delay] > 15 )
        )
```

Comparison options:	Function-based comparisons:
Table[Column] = [Measure]	
Table[Column] = Table[Column]	
[Measure1] > [Measure2]	
<true/false expr1> && <true/false expr2>	=AND(<true/false expr1>, <true/false expr2>)
<true/false expr1> || <true/false expr2>	=OR (<true/false expr1>, <true/false expr2>)
Any expression that evaluates to true/false	

Financial Calculations

common scenario

- Chart of Account dimension
- Level Rollups
- Parent-child source table
- Unary Operators

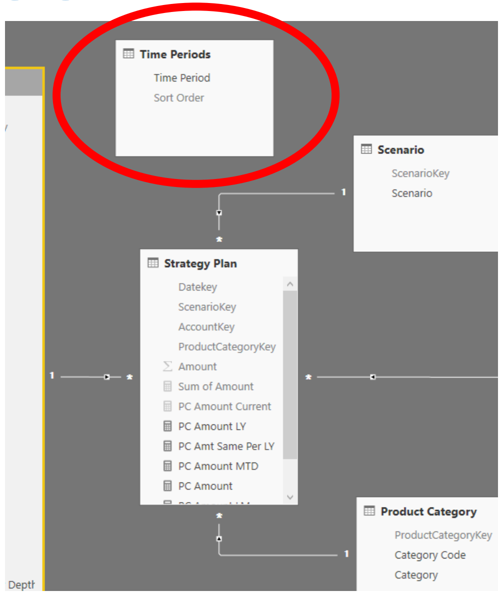


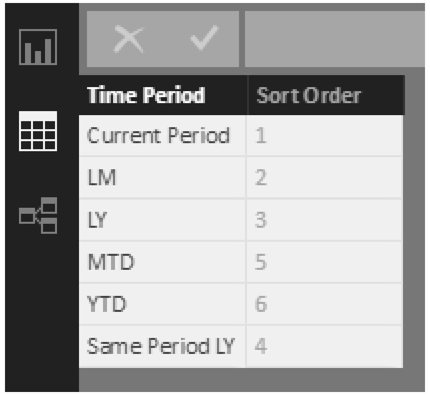
Level 1	PC Amount
Profit and Loss after tax	$3,378,795,723.2516
Profit and Loss before tax	$5,404,707,805.2889
Expense	($16,021,006,428.087299)
Cost of Goods Sold	$9,354,804,873.4778
Selling, General & Administrative Expenses	$6,666,201,554.6095
Administration Expense	$624,495,173.3963
Human Capital	$1,169,650,123.0862
IT Cost	$584,664,479.2223
Light, Heat, Communication Cost	$583,611,720.423
Marketing Cost	$2,515,889,395.0696
Back-to-School Ad Cost	$464,825,139.0068
Business Ad Cost	$90,085,597.9358
Holiday Ad Cost	$1,748,510,477.2632
Internet	$577,008,457.791
Other	$87,425,522.3202
Print	$839,285,031.5274
Radio & TV	$244,791,465.6246
Spring Ad Cost	$170,888,263.6368
Tax Time / Summer Ad Cost	$41,579,917.227
Other Expenses	$82,621,148.3998
Property Costs	$1,105,269,515.0123
Income	$21,425,714,233.3762
Sale Revenue	$21,425,714,233.3762
Taxation	($2,025,912,082.0373001)
Total	

Using Disconnected Tables

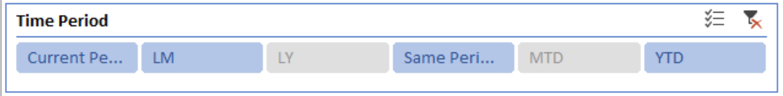
May be used to:

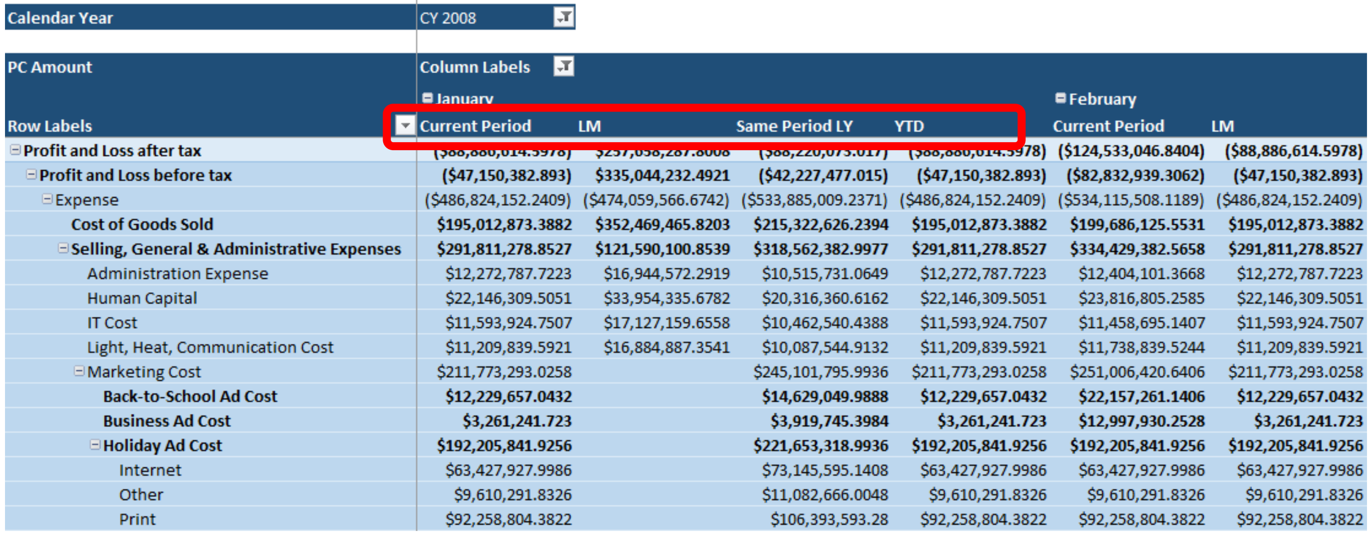
- Pass "parameters" to a measure without filtering other model elements
- Implement conditional measure behavior
- Dynamically slice specialized measure calculations





Time Period	Sort Order
Current Period	1
LM	2
LY	3
MTD	5
YTD	6
Same Period LY	4



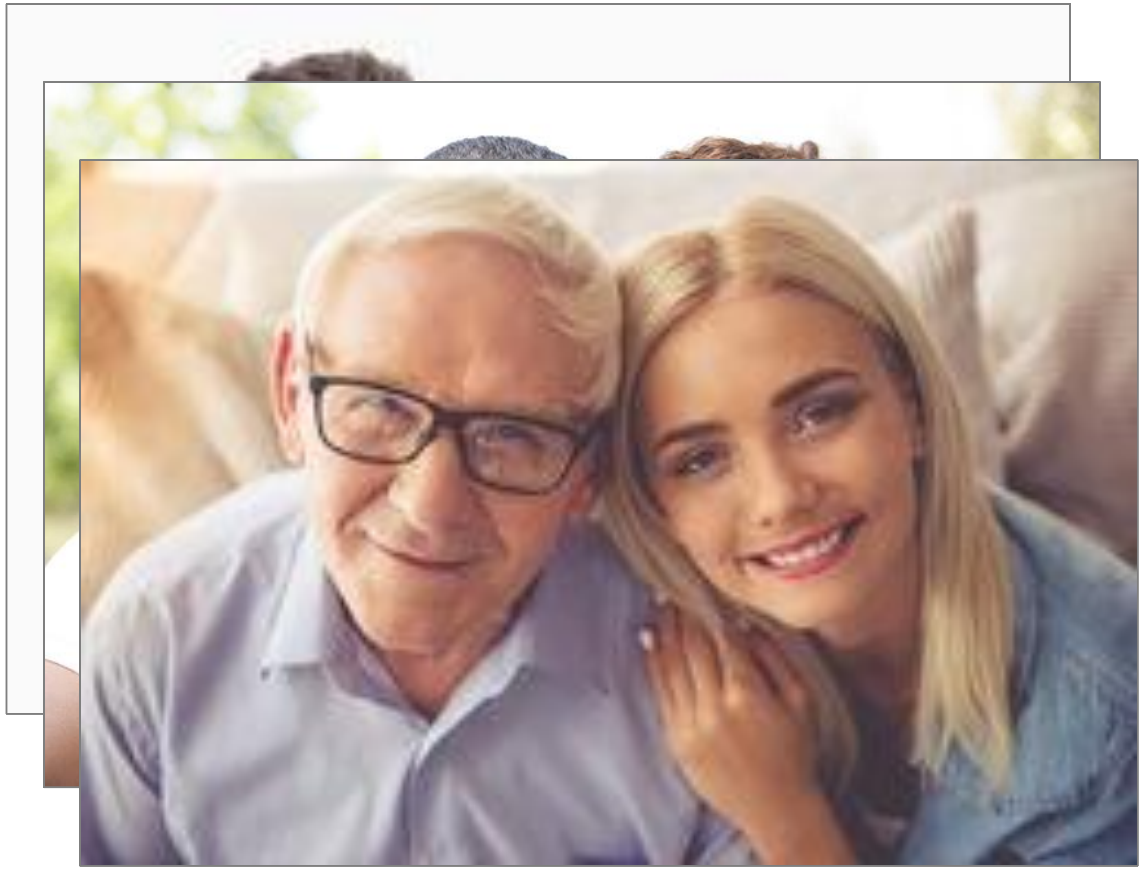


Calendar Year	CY 2008

PC Amount	Column Labels					
	January				February	
Row Labels	Current Period	LM	Same Period LY	YTD	Current Period	LM
Profit and Loss after tax	($88,886,614.5978)	$257,658,287.8008	($88,220,073.017)	($88,886,614.5978)	($124,533,046.8404)	($88,886,614.5978)
Profit and Loss before tax	($47,150,382.893)	$335,044,232.4921	($42,227,477.015)	($47,150,382.893)	($82,832,939.3062)	($47,150,382.893)
Expense	($486,824,152.2409)	($474,059,566.6742)	($533,885,009.2371)	($486,824,152.2409)	($534,115,508.1189)	($486,824,152.2409)
Cost of Goods Sold	$195,012,873.3882	$352,469,465.8203	$215,322,626.2394	$195,012,873.3882	$199,686,125.5531	$195,012,873.3882
Selling, General & Administrative Expenses	$291,811,278.8527	$121,590,100.8539	$318,562,382.9977	$291,811,278.8527	$334,429,382.5658	$291,811,278.8527
Administration Expense	$12,272,787.7223	$16,944,572.2919	$10,515,731.0649	$12,272,787.7223	$12,404,101.3668	$12,272,787.7223
Human Capital	$22,146,309.5051	$33,954,335.6782	$20,316,360.6162	$22,146,309.5051	$23,816,805.2585	$22,146,309.5051
IT Cost	$11,593,924.7507	$17,127,159.6558	$10,462,540.4388	$11,593,924.7507	$11,458,695.1407	$11,593,924.7507
Light, Heat, Communication Cost	$11,209,839.5921	$16,884,887.3541	$10,087,544.9132	$11,209,839.5921	$11,738,839.5244	$11,209,839.5921
Marketing Cost	$211,773,293.0258		$245,101,795.9936	$211,773,293.0258	$251,006,420.6406	$211,773,293.0258
Back-to-School Ad Cost	$12,229,657.0432		$14,629,049.9888	$12,229,657.0432	$22,157,261.1406	$12,229,657.0432
Business Ad Cost	$3,261,241.723		$3,919,745.3984	$3,261,241.723	$12,997,930.2528	$3,261,241.723
Holiday Ad Cost	$192,205,841.9256		$221,653,318.9936	$192,205,841.9256	$192,205,841.9256	$192,205,841.9256
Internet	$63,427,927.9986		$73,145,595.1408	$63,427,927.9986	$63,427,927.9986	$63,427,927.9986
Other	$9,610,291.8326		$11,082,666.0048	$9,610,291.8326	$9,610,291.8326	$9,610,291.8326
Print	$92,258,804.3822		$106,393,593.28	$92,258,804.3822	$92,258,804.3822	$92,258,804.3822

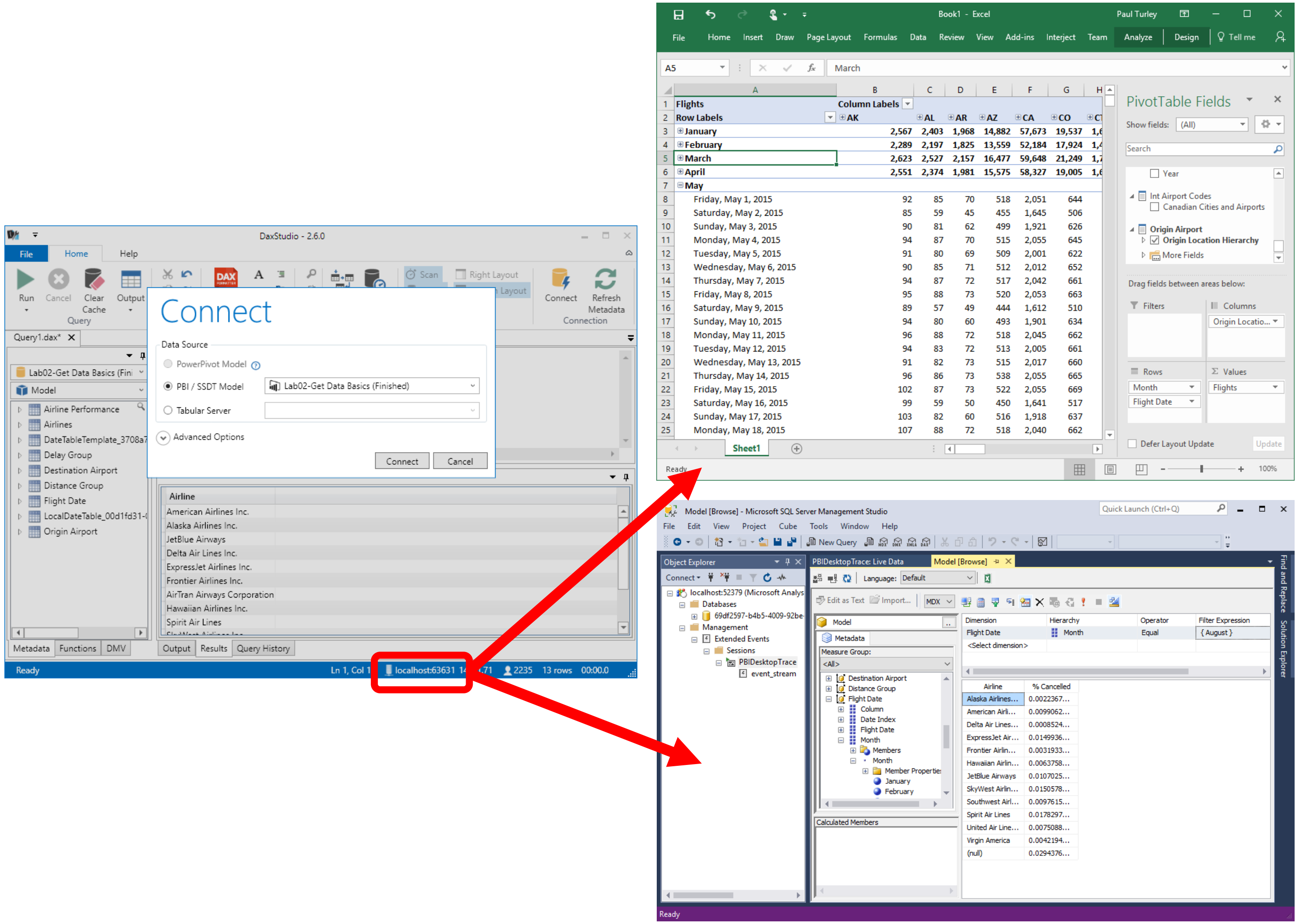
Power BI and Excel

How is their relationship?



Use DAX Studio to Get Power BI Connection

- DAX Studio exposes the random port number Power BI Desktop uses to connect to the local SSAS server (msmdsrv.exe)
- Use the connection string localhost:XXXXX to connect with Excel, SQL Server Profiler, SSMS or any other OLAP client.



Connect

Data Source

○ PowerPivot Model

● PBI / SSDT Model: Lab02-Get Data Basics (Finished)

○ Tabular Server

Advanced Options

Connect | Cancel

Airline
American Airlines Inc.
Alaska Airlines Inc.
JetBlue Airways
Delta Air Lines Inc.
ExpressJet Airlines Inc.
Frontier Airlines Inc.
AirTran Airways Corporation
Hawaiian Airlines Inc.
Spirit Air Lines

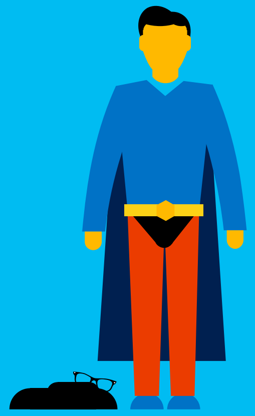
Ready Ln 1, Col 1 localhost:63631 2235 13 rows 00:00.0

Flights	Column Labels					
Row Labels	AK	AL	AR	AZ	CA	CO
January	2,567	2,403	1,968	14,882	57,673	19,537
February	2,289	2,197	1,825	13,559	52,184	17,924
March	2,623	2,527	2,157	16,477	59,648	21,249
April	2,551	2,374	1,981	15,575	58,327	19,005
May						
Friday, May 1, 2015	92	85	70	518	2,051	644
Saturday, May 2, 2015	85	59	45	455	1,645	506
Sunday, May 3, 2015	90	81	62	499	1,921	626
Monday, May 4, 2015	94	87	70	515	2,055	645
Tuesday, May 5, 2015	91	80	69	509	2,001	622
Wednesday, May 6, 2015	90	85	71	512	2,012	652
Thursday, May 7, 2015	94	87	72	517	2,042	661
Friday, May 8, 2015	95	88	73	520	2,053	663
Saturday, May 9, 2015	89	57	49	444	1,612	510
Sunday, May 10, 2015	94	80	60	493	1,901	634
Monday, May 11, 2015	96	88	72	518	2,045	662
Tuesday, May 12, 2015	94	83	72	513	2,005	661
Wednesday, May 13, 2015	91	82	73	515	2,017	660
Thursday, May 14, 2015	96	86	73	538	2,055	665
Friday, May 15, 2015	102	87	73	522	2,055	669
Saturday, May 16, 2015	99	59	50	450	1,641	517
Sunday, May 17, 2015	103	82	60	516	1,918	637
Monday, May 18, 2015	107	88	72	518	2,040	662

Dimension	Hierarchy	Operator	Filter Expression
Flight Date	Month	Equal	{ August }
<Select dimension>			

Airline	% Cancelled
Alaska Airlines...	0.0022367...
American Airli...	0.0099062...
Delta Air Lines...	0.0008524...
ExpressJet Air...	0.0149936...
Frontier Airlin...	0.0031933...
Hawaiian Airlin...	0.0063758...
JetBlue Airways	0.0107025...
SkyWest Airlin...	0.0150578...
Southwest Airl...	0.0097615...
Spirit Air Lines	0.0178297...
United Air Line...	0.0075088...
Virgin America	0.0042194...
(null)	0.0294376...

Recommended Practices



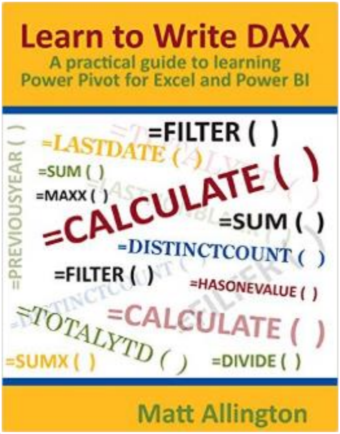
- Learn DAX concepts before function syntax
- Learn DAX essential functions… Learn these first:

  SUM, AVERAGE, MIN, MAX, COUNT, COUNTROWS, CALCULATE, FILTER, IF
- Name measure so users can find them
- Don’t try to memorize complex DAX
- Build a library of useful examples, books & articles
- Work in iterations
- Understand measure categories:

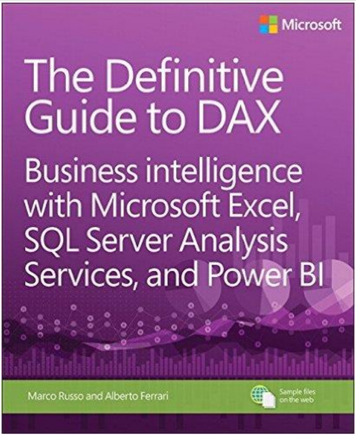
  aggregates, time & ratios, business-specific, KPI parts

Resources

- QuickStart: Learn DAX Basics in 30 Minutes
  https://support.office.com/en-us/article/QuickStart-Learn-DAX-Basics-in-30-Minutes-51744643-c2a5-436a-bdf6-c895762bec1a
- PowerPivotPro YouTube channel
  https://www.youtube.com/powerpivotpro
- DAX Patterns, DAX Puzzle, DAX Formatter:
  http://www.daxpatterns.com, SQLBI.com
- Books:



Power Pivot
AND
Power BI
The Excel User's Guide to DAX, Power Query, Power BI & Power Pivot in Excel 2010-2016
2nd Edition
Rob Collie & Avichal Singh


Microsoft
The Definitive Guide to DAX
Business intelligence with Microsoft Excel, SQL Server Analysis Services, and Power BI
Marco Russo and Alberto Ferrari
Sample files on the web

Contact Information

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b SqlServerBi.blog

l linkedin.com/in/pturley

t @paul_turley

Presentation and Materials:
http://tinyurl.com/MontrealPBI0517