

User Guide & Policy Overview

Introduction

This document is a comprehensive guide to the Property Tax Scenario Lab. This specialized tool was developed to simulate and analyze potential reforms to Oregon's complex property tax system. This document contains a step-by-step explanation of the tool's mechanics, including:

- A summary of how Oregon's property tax system works.
- A glossary of key terms.
- An outline of the datasets and specific fields utilized.
- A detailed description of the data handling, parameters, and calculation logic implemented.
- A guide to practical applications for conducting analysis using the tool.

This tool provides structure for informed policy analysis regarding property taxation in Oregon. Users can manipulate various data points to analyze how changes impact the amount of local property tax revenue collected by the county. It can also assist in assessing potential revenue impacts on taxing districts and homeowners under various proposed reform scenarios, offering insights into the consequences of legislative changes and helping to forecast and manage property tax-related outcomes.

Understanding Oregon's Property Tax System

Oregon's property tax system, a critical funding source for essential local services, is notably complex due to a series of voter-approved constitutional reforms: Measure 5 (1990) and Measure 50 (1997). These measures aimed to limit and stabilize property taxes.

At its core, property tax is calculated by multiplying a property's value by its tax rate. However, Oregon's system introduces several unique layers to this process, particularly concerning how a property's value is determined and how tax rates are applied.

Property Valuation: RMV, AV, and MAV

To understand how property taxes are calculated in Oregon, it's essential to differentiate between three distinct measures of a property's value:

- **Real Market Value (RMV):** The Real Market Value represents the price a property would likely sell for on the open market today. This is the value most commonly associated with a property's market worth.
- **Assessed Value (AV):** While the RMV reflects market realities, property taxes in Oregon are not directly calculated on the RMV. Instead, they are based on the Assessed Value.
- **Maximum Assessed Value (MAV):** The Maximum Assessed Value is a critical component that limits how quickly the AV can grow each year.

As a result, property's AV is the lower of its RMV or MAV.

Tax Rate Determination

A property's tax rate is determined by its levy code. This geographic identifier represents the sum of all applicable tax rates from the various overlapping taxing districts that provide services in a specific area. Each district, whether for schools, public safety, libraries, or parks, has its own billing rate. The levy code combines these individual rates to determine the total tax rate for a particular property.

The Impact of Compression

A central element of Oregon's property tax complexity is compression, a mechanism stemming from Measure 5. This constitutional amendment limits the amount homeowners can be taxed based on their property's RMV. If the calculated taxes for a property exceed this Measure 5 cap, compression is triggered. When compression occurs, taxes are proportionally reduced in a predefined order based on levy type until they fall within the constitutional limit. Consequently, compression can lead to taxing districts collecting less revenue than initially intended.

This process is further influenced by the interplay between a levy's Measure 5 category and its levy type. The Measure 5 category dictates which constitutional spending limit applies, or if the levy is exempt from these limits. Simultaneously, the levy type specifies the nature of the tax, which in turn dictates its priority and order of reduction if compression is triggered. Therefore, both classifications are essential for understanding the full financial impact and regulatory treatment of any given tax levy.

Calculating Oregon Property Taxes

Due to these complexities, calculating Oregon property taxes involves a multi-step process:

1. **Extended Tax Calculation:** The initial step involves applying the property's tax rates to its Assessed Value (AV) to determine the extended tax.
2. **Compression Evaluation:** The extended taxes are then evaluated against the Measure 5 caps, which are aligned with specific Measure 5 categories.
3. **Compression Application:** If the extended taxes exceed the Measure 5 caps, compression is applied. This process reduces the extended tax to arrive at the imposed tax, which is the final amount due. The difference between the extended and imposed tax represents the compression amount.

While aiming for limitation and stability for homeowners, fully grasping how property taxes are determined in Oregon requires understanding this detailed system.

Glossary of Property Tax Terms

Property Values:

- **Real Market Value (RMV):** The true market value of a property as determined by the county assessor.

- **Maximum Assessed Value (MAV):** A capped value that limits how much a property's assessed value can increase year-over-year. Under current policy, this limit is 3%, unless a qualifying exception event (e.g., new construction, remodeling, zoning changes) allows MAV to increase by more than this limit.
- **Assessed Value (AV):** The value against which property taxes are calculated, which is the lesser of RMV or MAV under current policy.

Compression: The process by which property taxes are reduced if the total tax calculated exceeds the constitutional limits set by Measure 5. During compression, taxes are reduced in a set order, proportionally until they fall within the M5 caps: first local option levies, then permanent rate taxes, and if needed, certain other debt-related levies (excluding general obligation bonds).

Geographic Identifiers:

- **Taxing District:** These are overlapping geographical areas, such as county government, cities, and various special districts (e.g., school, fire/rescue, library, park, urban renewal, watershed), that collect property taxes to fund specific public services. Each district operates with its own permanent tax rate and may have additional voter-approved levies or bond debt.
- **Levy Code:** An identifier that represents a specific combination of all overlapping taxing districts applicable to a property. It serves to aggregate all relevant permanent rates, voter-approved levies, and bond debt, enabling the calculation of the total property tax for that property.

Tax Rate Information:

- **Billing Rate:** The rate at which a specific levy is charged per thousand dollars of assessed value.
- **Measure 5 Category:** A classification for tax levies that determines if they are subject to Oregon's constitutional tax limits of \$5 per \$1,000 of Real Market Value (RMV) for Education or \$10 per \$1,000 of Real Market Value (RMV) for General Government, or if they are Unlimited (UNL) and thus not subject to compression.
 - **General Government (GG):** Refers to tax levies designated for the general operational expenses and services of local government. These levies are subject to the current 1% constitutional M5 cap.
 - **Education (ED):** Refers to tax levies designated for funding public education services. These levies are subject to the current 0.5% constitutional M5 cap.
 - **Unlimited (UNL):** Refers to tax levies that are explicitly not subject to the M5 constitutional compression limits.
- **Levy Type:** A classification that categorizes specific tax assessments based on their legal origin and purpose, influencing their treatment during tax calculation and compression.

- **Bond (B):** A levy type that collects taxes specifically for the repayment of voter-approved general obligation bond debt.
- **Local Option (LO):** A levy type representing temporary tax measures approved by voters for specific purposes.
- **Permanent (P):** A levy type referring to established, ongoing tax rates that fund the general operations of a taxing district.
- **Permanent Excluded (PE):** A levy type that is functionally similar to a Permanent levy, specifically referring to a portion of the Portland Public Schools (PPS) permanent rate that may be excluded at their discretion from certain urban renewal plans. Categorized as a permanent rate for compression purposes.
- **Qualified Pension (QP):** A levy type dedicated to funding public employee pension obligations. Categorized as a permanent rate for compression purposes.

Tax Calculations:

- **Extended Tax:** The total amount of tax calculated for a property by summing up all pre-compression taxes.
- **Imposed Tax:** The final amount of property tax due on a property after compression.
- **Compression Amount:** The total amount by which a property's taxes were reduced due to the application of M5 constitutional limits (calculated as the difference between the Extended Tax and the Imposed Tax).

Understanding Tool Limitations

The Property Tax Scenario Lab is a powerful simulation tool, but like all models, it operates under certain limitations and assumptions. Understanding these is crucial for accurate interpretation of results and for recognizing that the tool serves as an analytical aid, not a definitive predictor of future tax outcomes.

While the mathematical calculations for the current year (2024) have been carefully refined and validated against actual property tax data to ensure a fair level of accuracy, predicting future scenarios inherently involves uncertainty. The reliability of any future simulated results is entirely dependent on the assumptions and growth rates entered by the user.

One of the most significant and unpredictable variables is Real Market Value (RMV) Growth Rate. RMV is influenced by a myriad of economic and market factors that are not dynamically accounted for within a fixed growth rate. These factors include, but are not limited to: broader economic conditions, local market dynamics, and external shocks.

The tool models RMV growth using a fixed annual growth rate, which users directly control. While this allows for flexible "what-if" scenario testing based on user-chosen inputs, it means the results reflect *those specific inputs* and not a guaranteed forecast. For instance, the default RMV Growth Rate of 5.8% is based on historical Multnomah County data, but actual future growth could vary significantly.

Furthermore, the model makes certain simplifying assumptions in its simulations. The entered RMV and MAV growth rates are applied uniformly across all properties in the simulation.

In reality, property values can appreciate or depreciate at different rates based on location, property type, condition, and other individual characteristics. While Maximum Assessed Value (MAV) can increase by more than the standard 3% limit due to "qualifying exception events" like new construction or remodeling, the tool's MAV growth rate parameter applies a single, user-defined rate across the board. It does not individually model the varying impacts of new construction on specific properties unless directly factored into the chosen growth rate.

Users are empowered with direct control over these critical input parameters. Therefore, it is essential to remember that the generated results are indicative of *potential outcomes* under specific conditions and should be interpreted with an understanding of these underlying assumptions and inherent market unpredictability.

Parameters

Parameters in this Tableau dashboard serve as interactive controls that allow users to define various "what-if" scenarios for property tax simulation. These user inputs are specifically designed to enable the modeling of commonly discussed reforms and changes within Oregon's property tax system, offering insights into their potential impact. The parameters empower users to adjust key variables that drive property value projections and tax calculations:

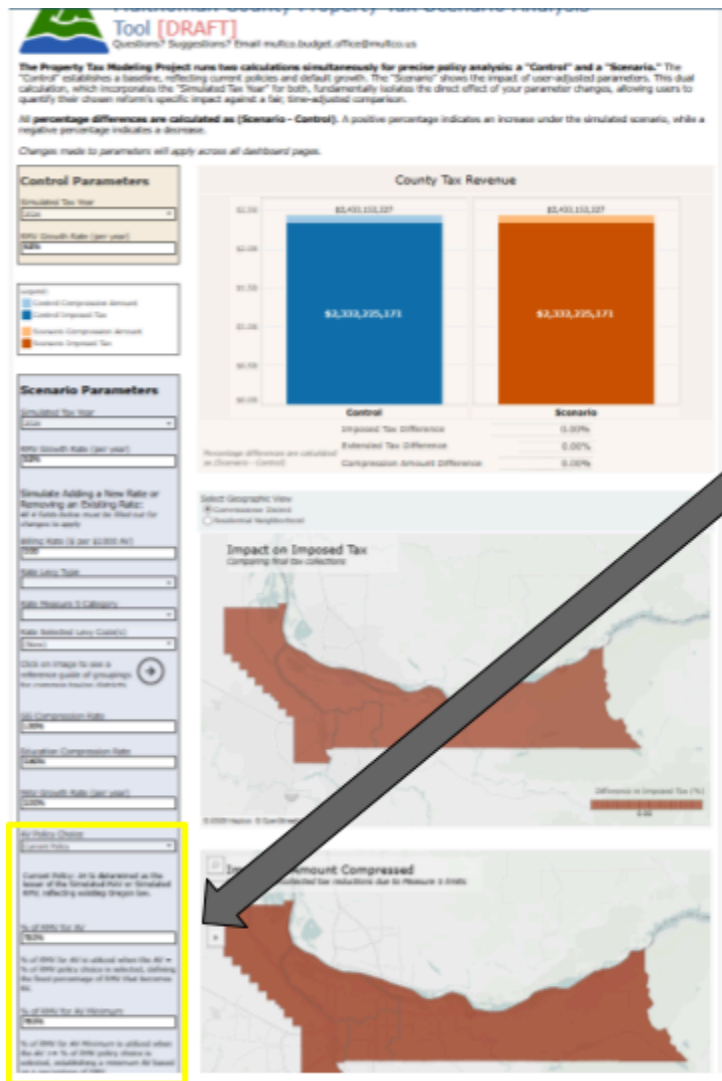
Control Parameters:

- **Control Simulated Tax Year:** This parameter allows users to select a specific future year for which they want to run the property tax simulation.
- **Control RMV Growth Rate (per year):** Users can define the annual growth rate for Real Market Value (RMV). This enables modeling the impact of varying market appreciation trends. *Default: 5.8%.*

Scenario Parameters:

- **Simulated Tax Year:** This parameter allows users to select a specific future year for which they want to run the property tax simulation.
- ***RMV Growth Rate (per year):** Users can define the annual growth rate for Real Market Value (RMV). This enables modeling the impact of varying market appreciation trends. *Default: 5.8%.*
- **Billing Rate (\$ per \$1000 AV):** This parameter allows users to input the specific dollar value of the added/removed tax rate per \$1000 of Assessed Value.
- **Rate Levy Type:** This parameter allows users to define the Levy Type (e.g., Local Option, Permanent, Bond) for the simulated added/removed tax rate.

- **Rate Measure 5 Category:** This parameter allows users to define the Measure 5 Category (General Government, Education, or Unlimited) for the added/removed tax rate.
- ****Rate Selected Levy Code(s):** This parameter allows users to select specific Levy Code areas where a new tax rate would apply or existing rate would be removed.
- **General Government Compression Rate:** This represents the constitutional limit for General Government taxes. Users can modify this to explore reforms related to the Measure 5 cap on general government levies. *Default: 1% of RMV/\$10 per \$1000 of RMV.*
- **Education Compression Rate:** This parameter sets the constitutional limit for Education taxes. It allows for analysis of potential changes to the Measure 5 cap on education levies. *Default: 0.5% of RMV/\$5 per \$1000 of RMV.*
- **MAV Growth Rate (per year):** This parameter allows the adjustment of the annual growth rate for Maximum Assessed Value (MAV). It's crucial for simulating changes to the Measure 50 cap on MAV growth. *Default: 3%.*
- **AV Policy Choice:** This is a critical reform lever, enabling users to select how Assessed Value (AV) is calculated:
 - **Current Policy:** AV is determined as the lesser of the Simulated MAV or Simulated RMV, reflecting existing Oregon law. *Default.*
 - **AV = % of RMV:** Allows users to simulate a policy where AV is set to a fixed percentage of the Simulated RMV.
 - **AV >= % of RMV:** Provides a floor for AV, where it's the greater of the "Current Policy" AV or a specified percentage of Simulated RMV.
- **% of RMV for AV:** This percentage is utilized when the "AV = % of RMV" policy choice is selected, defining the fixed percentage of RMV that becomes AV.
- **% of RMV for AV Minimum:** This percentage is applied when the "AV >= % of RMV" policy choice is selected, establishing a minimum AV based on a percentage of RMV.



AV Policy Choice

Current Policy

Current Policy

AV = % of RMV

AV >= % of RMV

% of RMV for AV

75.0%

% of RMV for AV is utilized when the AV = % of RMV policy choice is selected, defining the fixed percentage of RMV that becomes AV.

% of RMV for AV Minimum

75.0%

% of RMV for AV Minimum is utilized when the AV >= % of RMV policy choice is selected, establishing a minimum AV based on a percentage of RMV.

Technical Specification

Data Fields

The property tax simulation tool utilizes a comprehensive dataset sourced primarily from Multnomah County's Division of Assessment, Recording & Taxation (DART). This data is categorized into three core components: the foundational ORIONOUT dataset and its supplementary tabular appendages, spatial shapefiles, and tax rate data. For accurate and consistent analysis, these datasets should be updated annually with the most current available data.

ORIONOUT and Appendages

The original ORIONOUT dataset provides all core property-level information as of the tax roll certification date. Three additional DART-provided spreadsheets serve as appendages to ORIONOUT, enriching it with further property-specific details essential for calculation validation and compelling analysis.

Original ORIONOUT (“2026_0603_ORIONOUT” as of 7/28/26)

Note: When updating data, it is crucial that ORIONOUT and all its appendages originate from the same time period to ensure accuracy and consistency.

- **Quick Ref ID:** The primary, unique identifier for a property within the assessment and tax system. Every property in the Multnomah County system is assigned a Quick Ref ID to uniquely identify it for all tax-related operations and data.

Note: The ‘Alternate Account Number’ is an optional secondary identifier that may be associated with a property. While every property has a Quick Ref ID, not every property has an Alternate Account Number. Thus, Quick Ref ID is consistently used as the core property identifier for this model.

- **Levy Code**
- **Real Market Value (RMV)**
- **Maximum Assessed Value (MAV)**
- **Assessed Value (AV)**

Note: This field is primarily used to validate the tool’s calculation logic for AV under current policies by comparing it against the provided AV data.

- **Imposed Tax**

Note: This field is primarily used to validate the tool’s calculation logic for imposed tax under current policies by comparing it against the provided imposed tax data.

- **Property Type:** A classification assigned to real or personal property that determines how it is assessed and taxed, based on its characteristics and use. Specific property types include:
 - **Billboard (BB):** Typically large outdoor advertising structures, often assessed as taxable personal property distinct from the land they occupy.
 - **Commercial (COM):** Real property primarily used for commercial purposes, including retail, office buildings, and other business establishments, and it is typically assessed as commercial real property.
 - **Floating Real Property (FLT):** Structures designed for long-term use on water, such as houseboats and floating homes, which are assessed as real property despite not being affixed to land.
 - **Industrial Local (IND):** Real property primarily used for manufacturing, processing, assembly, warehousing, or research and development. The term "Local" often indicates it's assessed and taxed at the local county level.
 - **Industrial Leasehold Improvements (LHI):** Additions, alterations, or improvements made by a tenant to leased industrial property, which are often considered

taxable personal property, especially if they are removable or assessed separately from the underlying real estate.

- Manufactured Structures (M): Factory-built homes that are not affixed to the land and are therefore assessed and taxed as personal property rather than real property.
- Industrial Machinery & Equipment (ME): The machinery, tools, and equipment used in industrial operations, which are typically assessed as tangible personal property for tax purposes.
- Mobile Home Park (MHP): Land developed and operated for the purpose of leasing spaces to manufactured homes, and it is typically assessed as commercial real property.
- Moorage (MRG): Facilities or areas providing docking, anchorage, or securement for boats and other floating structures, often assessed as commercial real property.
- Personal Property (PP): Tangible assets that are not real estate, primarily used in business, and subject to annual assessment (e.g., business furniture, fixtures, equipment).
- Personal Property Industrial (PPI): A more specific subset of personal property, focusing on the taxable tangible assets directly used in industrial operations, distinguishing them from general business personal property.
- Residential (RES): Real property primarily used for housing, such as single-family homes, townhouses, and condominiums.
- Industrial State (SIND): Industrial properties that are subject to specific state-level assessment rules or are part of a state-defined industrial category, potentially differing from locally assessed industrial properties in tax treatment.
- Utilities (U): Properties owned and used by public utility companies, encompassing infrastructure such as power plants, electric lines, gas pipelines, water and sewer systems, and telecommunication networks. These specialized properties are often assessed and taxed under distinct methodologies due to their unique nature and public service function.

Extended and Compression Amounts

This dataset was custom-created to enable validation of the tool's calculation logic by comparing its simulated results under current policies against the provided actual extended and compression amounts.

- **Parcel Number:** An alternate name for Quick Ref ID.
Note: Used to execute data join to ORIONOUT.
- **Extended Amount**
- **Compression - GenGov:** The amount of compression applied specifically to General Government levies.
- **Compression - Education:** The amount of compression applied specifically to Education levies

- **Compression - Total**

Latitude and Longitude

This dataset was custom-created to enable precise map visualizations, plotting individual properties as points.

- **Quick Ref ID**

Note: Used to execute data join to ORIONOUT.

- **Longitude:** The longitudinal coordinate of the property associated with its Situs Address.
- **Latitude:** The latitudinal coordinate of the property associated with its Situs Address.

To use Latitude and Longitude for map visualizations in Tableau Desktop, ensure they are correctly configured:

1. Change Data Type to Number (Decimal): In the Data pane, click the data type icon next to **Latitude** and **Longitude** (likely "Abc") and select "Number (Decimal)"
2. Convert to Measure: Confirm **Latitude** and **Longitude** are in the "Measures" section of the Data pane. If not, drag them there.
3. Assign Geographic Role: For **Latitude**, click its geographic role icon, go to "Geographic Role", and select "Latitude". Do the same for **Longitude**, selecting "Longitude".

Once these steps are completed, you will be able to drag **Latitude** to the Rows shelf and **Longitude** to the Columns shelf to create a map visualization. Tableau will recognize these fields as geographic data, allowing you to plot locations on a map.

Commissioner District and Neighborhood

This dataset was custom-created to facilitate intuitive data segmentation, enabling clearer insights and analysis.

When making this request to DART, you will need to connect with a member of their GIS team since the work requires doing spatial joins with the neighborhood join being a custom join that differs from the way DART normally organizes their data.

- **Quick Ref ID**

Note: Used to execute data join to ORIONOUT.

- **District:** Commissioner district number of the property associated with its Situs Address.
- **NBO:** Alphanumeric neighborhood identifier of the property associated with its Situs Address, normalized to the Residential Neighborhood shapefile.

Note: DART categorizes neighborhoods in six different ways. For this model, all properties were normalized to the Residential Neighborhood shapefile, as its corresponding names and descriptions are most intuitively understood by policymakers

and the public. The provided **NBO** thus corresponds to this specific residential classification.

Shapefiles

These DART-provided shapefiles contain geometric spatial data, enabling area-based visualizations for commissioner districts and neighborhoods. The listed fields are essential for rendering these spatial visualizations and linking them to property data. **Note:** Check for possible redistricting since the last data request for the shapefiles.

Commissioner Districts

- **District**
- Spatial data to enable visualizations
 - **Shape_Leng:** Spatial metadata indicating the length of the shape's boundary.
 - **Shape_Area:** Spatial metadata indicating the area of the shape.
 - **Geometry:** The core spatial data that defines the polygon shape of the district.

Residential Neighborhoods

- **NBO**
- **NBO_DESCR1:** The descriptive name associated with the property's NBO.
- Spatial data to enable area visualizations – Not needed to understand the function of each field, rather just that all are necessary to enable proper visualization of the neighborhoods.
 - **Shape_Leng**
 - **Shape_Area**
 - **Geometry**

Tax Rates

This dataset provides all applicable tax rates for the given year for each levy code in Multnomah County.

- **Levy Code**
- **Billing Rate**
- **Measure 5 Category**
 - General Government (GG)
 - Education (ED)
 - Unlimited (UNL)
- **Levy Type:**
 - Bond (B)
 - Local Option (LO)

- Permanent (P)
- Permanent Excluded (PE)
- Qualified Pension (QP)
- Urban Renewal Special Levy (URSL)

Email Template for 2025 DART Data Request

Subject: Request for 2025 Property Tax Data - Property Tax Modeling Project

Dear Larry,

Hope you're doing well.

As we approach the fall, our team is preparing to update the Property Tax Modeling Project with the latest data. We are requesting the 2025 property tax data from DART to ensure the tool remains current and accurate for policy analysis.

Below is a detailed list of the data we need, along with notes on who provided similar data in previous cycles for your reference:

1. ORIONOUT Dataset & Tabular Appendages (Property-Level Data)
 - a. Core ORIONOUT (as previously provided by you, Larry):
 - i. Quick Ref ID
 - ii. Levy Code
 - iii. Real Market Value (RMV)
 - iv. Maximum Assessed Value (MAV)
 - v. Assessed Value (AV)
 - vi. Imposed Tax
 - vii. Property Type
 - viii. Crucial Note: Please provide this ORIONOUT data as of the tax roll certification date.
 - b. Extended and Compression Amounts (as previously provided by Jon Winner):
 - i. Parcel Number (used as Quick Ref ID for joining)
 - ii. Extended Amount
 - iii. Compression - GenGov
 - iv. Compression - Education
 - v. Compression - Total
 - c. Latitude and Longitude (as previously provided by Leslie Lee):
 - i. Quick Ref ID
 - ii. Longitude
 - iii. Latitude
 - d. Commissioner District and Neighborhood (as previously provided by Nick Kovac):
 - i. Quick Ref ID
 - ii. Commissioner District

- iii. NBO (Please ensure this is normalized to the Residential Neighborhood shapefile, as before)
 - iv. Important Note: Nick's expertise with this custom join, specifically normalizing all properties to the Residential Neighborhood shapefile, is crucial for our model's consistency. His past experience with this unique request ensures accurate and quick replication.
- 2. Spatial Shapefiles *only if any changes since 6/30/2025 (as previously provided by Nick Kovac):
 - a. Commissioner Districts Shapefile:
 - i. District
 - ii. Shape_Leng
 - iii. Shape_Area
 - iv. Geometry
 - b. Residential Neighborhoods Shapefile:
 - i. NBO
 - ii. NBO_DESCRI
 - iii. Shape_Leng
 - iv. Shape_Area
 - v. Geometry
- 3. Tax Rates Data (as previously provided by you, Larry):
 - a. Levy Code
 - b. Billing Rate
 - c. Measure 5 Category (General Government, Education, Unlimited)
 - d. Levy Type (Bond, Local Option, Permanent, Permanent Excluded, Qualified Pension)

Please let us know the best way to receive these files and the timeline we should be aware of for their availability this fall. We are happy to coordinate with the relevant DART team members as needed. Thank you very much for your continued support.

Best regards,

[Your Name]

[Your Title]

[Your Team/Department]

[Your Contact Information]

Leveraging Tableau Software: A High-Level Workflow for Simulation Tool Development

The Property Tax Scenario Lab was developed using Tableau Prep Builder and Tableau Desktop, creating a robust workflow from initial data handling to interactive simulation.

Tableau Prep Builder was foundational in establishing a reliable data structure for the complex property tax system. It enabled comprehensive cleaning, structuring, and combining of raw property tax data from disparate sources. Prep Builder performed critical tasks such as removing duplicates, addressing missing values, correcting inconsistent formatting, and executing necessary transformations (mainly data joins), ultimately producing a unified, clean dataset essential for accurate modeling.

Following data preparation, Tableau Desktop served as the primary environment for the tool's analytical engine and interactive interface. Desktop connected to Prep Builder's optimized output, facilitating the development of custom calculated fields to project property values and apply complex tax logic. It enabled the creation of interactive parameters, allowing users to define dynamic "what-if" scenarios. The refined data also supported the construction of comprehensive visualizations and interactive dashboards, central to presenting insights and enabling informed decision-making in property taxation.

This collaborative workflow, harnessing Tableau's strengths from data connection and preparation in Prep Builder to dynamic analysis and visualization in Desktop, ensured data integrity, supported complex simulations, and provided a powerful, accurate tool for insights into property tax dynamics.

Data Joining Logic

The property tax simulation tool relies on a meticulously integrated dataset, achieved through a multi-phase data joining workflow within Tableau Prep. This process consolidates diverse raw data sources into a unified, aggregated dataset, enabling comprehensive analysis and interactive visualization. Join result notes are in reference to 2025 data.

Phase 1: Property-level Data Expansion

The workflow began by enriching the primary property-level data from ORIONOUT. Three supplementary tabular datasets from DART were progressively integrated using **outer joins** to expand the ORIONOUT records. The directions of joins were determined by the way that each dataset populated in Tableau Prep; directionality should remain relative to the positions of the primary and appended datasets.

1. The *Extended and Compression Amount* (right source) was **left-joined** to ORIONOUT (left source) via **Quick Ref ID/Parcel Number**. This ensured all properties from the ORIONOUT dataset were retained as the foundational set; properties without a matching Parcel Number in the DART data were included, with nulls for the added fields, maintaining the full property list's integrity.

- a. 1,906 excluded and unmatched rows from *Extended and Compression Amount*. 3,344 included and unmatched values from ORIONOUT. 309,384 matched and included values. Overall join result of 312,728 values.

2. The *Latitude and Longitude* (left source) was **right-joined** to the continually expanded ORIONOUT/Join 1 (right source) on **Quick Ref ID**. This preserved all properties while adding spatial coordinates, populating nulls for properties without associated spatial data.
 - b. 1,583 excluded and unmatched rows from *Latitude and Longitude*. 1,726 included and unmatched values from Join 1. 311,002 matched and included values. Overall join result of 312,728 values.
3. The *Commissioner District and Neighborhood* tabular data (left source) was similarly **right-joined** to the expanded ORIONOUT/Join 2 (right source) on **Quick Ref ID**, further enriching the records with geographic attributes.
 - c. 252 excluded and unmatched rows from *Commissioner District and Neighborhood*. 30,081 included and unmatched values from Join 2. 282,647 matched and included values. Overall join result of 312,728 values.

Phase 2: Data Cleaning 1

Following the initial expansion, the combined ORIONOUT dataset underwent a rigorous manual cleaning process to optimize data quality and application performance.

- **Column Removal:** Unnecessary columns not essential for calculations or visualizations were systematically removed to optimize application performance. This included fields from the original ORIONOUT and redundant or irrelevant fields from the appended datasets.
 - CommDistandNeighborhoods: **TARGET_FID**
 - LatitudeandLongitude: **QuickRefID-1**
 - Extended and Compression Amounts: **Parcel Number, MTL, Situs, Property Type, Real Market Value, Measure 5 Value, MAV-1, Assessed Value, Imposed Amount**
 - ORIONOUT fields: **QuickRefID-2, PartyName, mailaddr1, mailaddr2, mailaddr3, City, ST, ZIP, Country, Legal Description, LevyDistricts, PropClass, PropCode, LandSqFt, Land Acres, ImptSqFt, YrBlt, SaleDate, SaleType, SalePrice, land_RMV, SAV, impt_RMV, EXcodes, EXtotal, DataRanDate**
- **Field Renaming and Data Types:** For clarity and to guarantee functionality when loading into the scenario lab, various fields from the datasets were renamed and one undergoes a data type change
 - ORIONOUT fields:
 - **NBHD → NBHD (formal)**
 - **CertTaxYr or TaxYear → Tax Year** (space necessary), and data type is changed from Abc to Number (whole)
 - CommDistandNeighborhoods

■ NBO → NBO (Res normalized)

- **Filtering for Data Integrity:** The dataset was then filtered to ensure calculation reliability. Properties lacking a valid **Imposeditax**, **MAV**, or **Total_RMV** were excluded. Specifically, properties with **Imposeditax = 0.00/null** were filtered out to accurately account for all taxable revenue. Similarly, properties with **MAV = 0/null** or **Total_RMV = 0/null** were excluded, as these values are fundamental inputs for the accurate calculations.
 - **Filter Result:** removes 20,258 rows, 292,470 rows remaining
 - **Note:** ORIONOUT may include properties that have zero ImposedTax but a non-zero MAV or Total_RMV. These properties are most likely publicly-owned, tax-exempt utilities. These properties will be excluded during this filtering step. Including these properties would distort the calculations in the Scenario Lab by calculating a positive tax for non-taxable properties. This exclusion represents a non-trivial amount of AV (5.6B in 2026).

Phase 3: Integrating Shapefiles

The next phase involved integrating precise spatial geometry. Two shapefiles from DART, *Commissioner Districts* and *Residential Neighborhoods* were **outer joined** to the expanded ORIONOUT dataset:

1. The *Commissioner Districts* shapefile (left source) was **right-joined** to the expanded ORIONOUT/Clean 3 (right data source) on **DISTRICT**.
 - a. All 4 values included and matched from *Commissioner Districts*, 24,624 unmatched and included rows from Clean 4, and 267,846 matched and included rows. Overall join result of 292,470 rows.
2. The *Residential Neighborhoods* shapefile (left source) was **right-joined** to the continually joined dataset/Join 4 (right data source) on **NBO**.
 - a. All 79 values included and matched from *Residential Neighborhoods*, 24,621 unmatched and included rows from Join 4, and 267,849 matched and included rows. Overall join result of 292,470 rows.

Each shapefile contains geometric data for its respective area, ensuring that every property is associated with its correct spatial attributes for location-based analysis and visualization.

Phase 4: Data Cleaning 2

Following shapefile integration, the data was again cleaned to optimize quality and application performance.

- **Column Removal:** Unnecessary fields not essential for calculations or visualizations were systematically removed. Similarly, redundant fields were removed.
 - Commdist2026: **DISTRICT-1**, **RefScale**, **ScaleNum**, **LngScaleN**

- Residential Neighborhoods: `NB0`, `Market_Gro`, `CY_Ratio`, `Ratio 2024`, `ReferenceG`, `Ratio2025`, `Ratio2026`, `Ratio2027`
- **Field Renaming:** Fields are renamed for clarity and for proper use in Tableau Desktop
 - Commdist2026: `Geometry` → `Geometry (Comm Dist)`
 - Residential Neighborhoods: `NB0_DESCRI` → `NB0Desc`, `Geometry` → `Geometry (Neighborhood)`

Phase 5: Integrating Tax Rates Data

The most conceptually intricate joining step involved integrating *Tax Rates*. The continually joined dataset/Clean 5 (left source) was **right-joined** to *Tax Rates* (right source) on `Levy Code/Levy`. This critical one-to-many relationship creates a 'tall' dataset where each property associates with multiple rows, each representing one of its applicable tax rates based on its levy code. If a property levy code in ORIONOUT is not found in *Tax Rates*, its corresponding tax rate fields display null values, maintaining dataset integrity while highlighting potential data gaps.

Note: It is imperative that the Tax Year fields in ORIONOUT and Tax Rates match. Check this carefully, as it is possible that the year listed in the name of either dataset does not match the value in the tax year field.

- 292,470 matched and included values from Clean 2 (appended ORIONOUT), 2,725 matched and included values from Clean 4 (Levy Codes). Overall join result of 3,145,728 rows.

Phase 6: Data Cleaning 3

Following the integration with Tax Rates, the data was again cleaned to optimize quality and performance.

- **Column Renaming:** Columns are renamed for proper implementation into the tool.
 - `Initial Billing Rate` → `Billing Rate`
 - `M5CategoryKey` → `M5 Category`
- **Column Removal:** Unnecessary columns not essential for calculations or visualizations were systematically removed to optimize application performance during development (`District Levy Name`, `Division of Tax Rate`, `Adjusted Billing Rate`, `Approval Code Key`, `District Code`, `District` (take care to make sure you're removing the district from Tax Rates)).
- **Column Recoding:** The Levy Type column from Tax Rates was not abbreviated in later versions of the data, resulting in errors in Scenario Lab implementation.
 - In Prep: Create Calculated Field → Field Name: `Levy Type Abbreviation`

```
CASE [Levy Type]
  WHEN 'Permanent' THEN 'P'
  WHEN 'Bond' THEN 'B'
  WHEN 'Local Option' THEN 'LO'
```

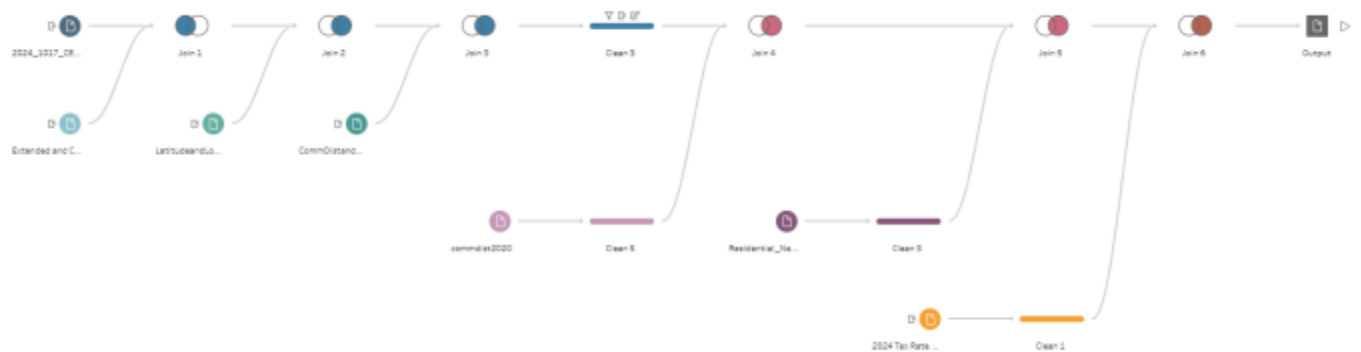
```

WHEN 'Permanent Excluded' THEN 'PE'
WHEN 'Qualified Pension' THEN 'QP'
ELSE 'O'
END

```

- **Rename** *Levy Type* to *Levy Type Full*, and then *Levy Type Abbreviation* to *Levy Type*. The final *Levy Type* column should have the short-hand abbreviations as the values. These abbreviations are essential for proper implementation into the tool.

Tableau Prep Builder High-level Flow:



Phase 7: Improving Performance

To improve performance and load times in the Tableau Desktop workbook, after finalizing core dashboards and features, “Hide All Unused Fields” was selected under Data Source → Connection → Edit. This hides unused fields from view without removing them from the data source, allowing for easy restoration if needed for future exploration.

Data Challenges to Address

Property-level Data Gaps

The property tax modeling tool has identified significant data quality challenges and completeness gaps, primarily stemming from inconsistencies between the core **ORIONOUT** dataset and its various tabular appendages. In Join 3 of the data workflow, approximately 29,576 properties from the ORIONOUT dataset (which itself contains 311,809 unique property identifiers) do not find corresponding tabular Commissioner District or Neighborhood information within the *CommDistandNeighborhood* appendage (which contains 282,234 unique identifiers). This discrepancy results in a substantial number of properties having null values for these

critical geographic attributes, which then propagate through subsequent spatial joins (Join 4 and Join 5).

Conversely, this join also revealed that 666 records present in the *CommDistandNeighborhood* tabular appendage do not have a matching **Quick Ref ID** within the ORIONOUT dataset and are thus excluded from the final combined data. This highlights that ORIONOUT, while foundational, is not a truly comprehensive source for all property-related information available, as it lacks entries for properties present in other DART-provided datasets.

These data inconsistencies are further complicated by the fact that the various source datasets were provided by different individuals within DART—ORIONOUT from Larry Steele, *Extended and Compression Amounts* from Jon Winner, *Latitude and Longitude* from Leslie Lee, and *Commissioner Districts and Neighborhoods* from Nick Kovac. Future development efforts should prioritize investigating these data completeness issues, potentially requiring cross-departmental data reconciliation or the identification of more holistic data sources to ensure maximum coverage and accuracy.

Calculation Logic

Scenario Calculation Logic:

A key concept in Tableau needed to understand the calculation logic are **FIXED Level of Detail (LOD) expressions**. They are powerful calculations that instruct Tableau to aggregate data at a precise, specified level, independent of the dimensions present in the visualization. Unlike standard calculations that adapt to the view's granularity, FIXED LODs compute their values based solely on the dimensions defined within their syntax (**{FIXED [Dimension(s)] : Aggregation(Measure)}**). This makes them invaluable in this tool for ensuring that specific aggregated values remain constant across different views. They often remain unaffected by most filters in the view due to their early position in Tableau's order of operations.

The following calculations are built out in Tableau. They are presented in their logical order of execution.

Property-Level Level of Detail (LOD) Calculations

These LOD calculations fix base values and user parameters at the individual property level. These calculations are needed because of the nature of the data Extract being structured so that each property spans several rows of the data. As a result, quantitative data fields that are duplicated across each row for the individual property such as fields from ORIONOUT or parameters would be multiplied by however many rows it had in the data and thus be very inaccurate.

- **Prop Tax Year** = **{FIXED [Quick Ref ID] : MIN([Tax Year])}**

- **Prop MAV** = {FIXED [Quick Ref ID] : MIN([MAV])}
- **Prop Total RMV** = {FIXED [Quick Ref ID] : MIN([Total RMV])}
- **Scenario Prop Simulated Tax Year** = {FIXED [Quick Ref ID] : MIN([Simulated Tax Year])}
- **Scenario Prop MAV Growth Rate** = {FIXED [Quick Ref ID] : MIN([MAV Growth Rate (per year)])}
- **Scenario Prop RMV Growth Rate** = {FIXED [Quick Ref ID] : MIN([RMV Growth Rate (per year)])}
- **Scenario Prop AV Policy Choice** = {FIXED [Quick Ref ID] : MIN([AV Policy Choice])}
- **Scenario Prop % of RMV for AV** = {FIXED [Quick Ref ID] : MIN([% of RMV for AV])}
- **Scenario Prop % of RMV for AV Minimum** = {FIXED [Quick Ref ID] : MIN([% of RMV for AV Minimum])}
- **Scenario Prop GG Compression Rate** = {FIXED [Quick Ref ID] : MIN([General Government Compression Rate])}
- **Scenario Prop ED Compression Rate** = {FIXED [Quick Ref ID] : MIN([Education Compression Rate])}

Core Simulated Values

- **Scenario Simulated MAV:** Projects the MAV forward based on the MAV growth rate

$$= [\text{Prop MAV}] * \text{POWER}((1.0 + [\text{Scenario Prop MAV Growth Rate}]), ([\text{Scenario Prop Simulated Tax Year}] - [\text{Prop Tax Year}]))$$
- **Scenario Simulated RMV:** Projects the RMV forward based on the RMV growth rate

$$= \text{IIF}([\text{Scenario Prop Simulated Tax Year}] > [\text{Prop Tax Year}], [\text{Prop Total RMV}] * \text{POWER}((1.0 + [\text{Scenario Prop RMV Growth Rate}]), ([\text{Scenario Prop Simulated Tax Year}] - [\text{Prop Tax Year}])), [\text{Prop Total RMV}])$$
- **Scenario Simulated AV:** Calculates the AV based on the selected policy parameter

$$= \text{IF } [\text{Scenario Prop AV Policy Choice}] = \text{"Current Policy"} \text{ THEN } \text{MIN}([\text{Scenario Simulated MAV}], [\text{Scenario Simulated RMV}])$$

$$\text{ELSEIF } [\text{Scenario Prop AV Policy Choice}] = \text{"AV = \% of RMV"} \text{ THEN } [\text{Scenario Simulated RMV}] * [\text{Scenario Prop \% of RMV for AV}]$$

$$\text{ELSEIF } [\text{Scenario Prop AV Policy Choice}] = \text{"AV >= \% of RMV"} \text{ THEN } \text{MAX}(\text{MIN}([\text{Scenario Simulated MAV}], [\text{Scenario Simulated RMV}]), [\text{Scenario Simulated RMV}] * [\text{Scenario Prop \% of RMV for AV Minimum}])$$

$$\text{ELSE}$$

0
END

Compression Caps

Determine the maximum tax allowed for General Government (GG) and Education (ED) categories based on the Simulated RMV.

- **Scenario GG Comp. Cap** = [Scenario Simulated RMV] * [Scenario Prop GG Compression Rate]
- **Scenario ED Comp. Cap** = [Scenario Simulated RMV] * [Scenario Prop ED Compression Rate]

Billing Rates

This section details how the tool calculates the total billing rate for each property, incorporating both existing tax rates and any user-defined simulated new tax rates. These aggregated billing rates are crucial for determining the **Pre-Compression Tax** and are categorized by **M5 Category** (General Government, Education, Unlimited) and **Levy Type** (Local Option, Permanent, etc.) to facilitate accurate assessment against constitutional limits and precise tracking of compression effects.

Given the "tall" structure of the dataset (where a single property can have multiple rows, each representing an applicable tax rate), special attention is paid to ensure that any simulated new tax rates are added exactly once per property. The process involves two levels of calculations for each category (GG LO, GG Perm, ED LO, ED Perm, UNL):

Row-Level Added Rates

These are row-level calculations that determine if the user's simulated new tax rate is applicable to the *current row's specific levy characteristics* and selected geographic area. They return the value of the simulated rate if all conditions are met otherwise they return 0.

- **Scenario GG LO Added Rate (Row)**
= IF [Rate Selected Levy Code(s)]
 AND [Rate Measure 5 Category] = "GG"
 AND [Rate Levy Type] = "LO"
THEN
 [Billing Rate (\$ per \$1000 AV)]
ELSE
 0

- END
- **Scenario GG Perm Added Rate (Row)**
 = IF [Rate Selected Levy Code(s)]
 AND [Rate Measure 5 Category] = "GG"
 AND ([Rate Levy Type] = "P" OR [Rate Levy Type] = "PE" OR
 [Rate Levy Type] = "QP")
 THEN
 [Billing Rate (\$ per \$1000 AV)]
 ELSE
 0
 END
 - **Scenario ED LO Added Rate (Row)**
 = IF [Rate Selected Levy Code(s)]
 AND [Rate Measure 5 Category] = "ED"
 AND [Rate Levy Type] = "LO"
 THEN
 [Billing Rate (\$ per \$1000 AV)]
 ELSE
 0
 END
 - **Scenario ED Perm Added Rate (Row)**
 = IF [Rate Selected Levy Code(s)]
 AND [Rate Measure 5 Category] = "ED"
 AND ([Rate Levy Type] = "P" OR [Rate Levy Type] = "PE" OR
 [Rate Levy Type] = "QP")
 THEN
 [Billing Rate (\$ per \$1000 AV)]
 ELSE
 0
 END
 - **Scenario UNL Added Rate (Row)**
 = IF [Rate Selected Levy Code(s)]
 AND [Rate Measure 5 Category] = "UNL"
 THEN
 [Billing Rate (\$ per \$1000 AV)]
 ELSE
 0
 END

Aggregated Billing Rates

These are Level of Detail (LOD) expressions that calculate the total billing rate for each property. They sum all applicable existing billing rates for the specific **M5 Category** and **Levy Type** combination and then conditionally add the simulated rate exactly once per property, leveraging the row-level Added Rate calculations.

- **Scenario GG LO Billing Rate**

```
= MAX(  
    0,  
    {FIXED [Quick Ref ID] :  
        SUM(IIF([M5 Category] = "GG" AND [Levy Type] = "LO",  
[Billing Rate], 0))  
    }  
    +  
    MAX([Scenario GG LO Added Rate (Row)])  
)
```

- **Scenario GG Perm Billing Rate**

```
= MAX(  
    0,  
    {FIXED [Quick Ref ID] :  
        SUM(IIF([M5 Category] = "GG" AND ([Levy Type] = "P" OR  
[Levy Type] = "PE" OR [Levy Type] = "QP"), [Billing Rate], 0))  
    }  
    +  
    MAX([Scenario GG Perm Added Rate (Row)])  
)
```

- **Scenario ED LO Billing Rate**

```
= MAX(  
    0,  
    {FIXED [Quick Ref ID] :  
        SUM(IIF([M5 Category] = "ED" AND [Levy Type] = "LO",  
[Billing Rate], 0))  
    }  
    +  
    MAX([Scenario ED LO Added Rate (Row)])  
)
```

- **Scenario ED Perm Billing Rate**

```
= MAX(  
    0,
```

```

    {FIXED [Quick Ref ID] :
        SUM(IIF([M5 Category] = "ED" AND ([Levy Type] = "P" OR
[Levy Type] = "PE" OR [Levy Type] = "QP"), [Billing Rate], 0))
        +
        MAX([Scenario ED Perm Added Rate (Row)])
    }
)

```

- **Scenario UNL Billing Rate**

$$= \text{MAX}(\text{0}, \{ \text{FIXED [Quick Ref ID] : } \sum(\text{IIF}([\text{M5 Category}] = \text{"UNL"}, [\text{Billing Rate}], 0)) + \text{MAX}([\text{Scenario UNL Added Rate (Row)}]) \})$$

Pre-Compression Taxes

Calculate the tax for each category before applying Measure 5 limits.

- **Scenario GG LO Pre-Comp. Tax** = $([\text{Scenario GG LO Billing Rate}] / 1000) * [\text{Scenario Simulated AV}]$
- **Scenario GG Perm Pre-Comp. Tax** = $([\text{Scenario GG Perm Billing Rate}] / 1000) * [\text{Scenario Simulated AV}]$
- **Scenario GG Total Pre-Comp. Tax** = $[\text{Scenario GG LO Pre-Comp. Tax}] + [\text{Scenario GG Perm Pre-Comp. Tax}]$
- **Scenario ED LO Pre-Comp. Tax** = $([\text{Scenario ED LO Billing Rate}] / 1000) * [\text{Scenario Simulated AV}]$
- **Scenario ED Perm Pre-Comp. Tax** = $([\text{Scenario ED Perm Billing Rate}] / 1000) * [\text{Scenario Simulated AV}]$
- **Scenario ED Total Pre-Comp. Tax** = $[\text{Scenario ED LO Pre-Comp. Tax}] + [\text{Scenario ED Perm Pre-Comp. Tax}]$
- **Scenario UNL Total Tax** = $([\text{Scenario UNL Billing Rate}] / 1000) * [\text{Scenario Simulated AV}]$

- **Scenario Extended Tax** = [Scenario GG Total Pre-Comp. Tax] + [Scenario ED Total Pre-Comp. Tax] + [Scenario UNL Total Tax]

Compression Logic

This waterfall logic calculates the amount of tax to be compressed and, more specifically, the amount of compression for each Levy Type.

- **Scenario GG Total Compression Amount** = MAX(0, ([Scenario GG Total Pre-Comp. Tax] - [Scenario GG Comp. Cap]))
- **Scenario GG LO Reduction** = MIN([Scenario GG Total Compression Amount], [Scenario GG LO Pre-Comp. Tax])
- **Scenario GG Remaining Comp. Amount** = [Scenario GG Total Compression Amount] - [Scenario GG LO Reduction]
- **Scenario GG Perm Reduction** = MIN([Scenario GG Remaining Comp. Amount], [Scenario GG Perm Pre-Comp. Tax])
- **Scenario ED Total Compression Amount** = MAX(0, [Scenario ED Total Pre-Comp. Tax] - [Scenario ED Comp. Cap])
- **Scenario ED LO Reduction** = MIN([Scenario ED Total Compression Amount], [Scenario ED LO Pre-Comp. Tax])
- **Scenario ED Remaining Comp. Amount** = [Scenario ED Total Compression Amount] - [Scenario ED LO Reduction]
- **Scenario ED Perm Reduction** = MIN([Scenario ED Remaining Comp. Amount], [Scenario ED Perm Pre-Comp. Tax])

Post-Compression and Final Output Calculations

Post-Compression Tax

The tax owed after reductions are applied.

- **Scenario GG LO Post-Comp. Tax** = [Scenario GG LO Pre-Comp. Tax] - [Scenario GG LO Reduction]
- **Scenario GG Perm Post-Comp. Tax** = [Scenario GG Perm Pre-Comp. Tax] - [Scenario GG Perm Reduction]
- **Scenario GG Total Post-Comp. Tax** = [Scenario GG LO Post-Comp. Tax] + [Scenario GG Perm Post-Comp. Tax]

- **Scenario ED LO Post-Comp. Tax** = [Scenario ED LO Pre-Comp. Tax] - [Scenario ED LO Reduction]
- **Scenario ED Perm Post-Comp. Tax** = [Scenario ED Perm Pre-Comp. Tax] - [Scenario ED Perm Reduction]
- **Scenario ED Total Post-Comp. Tax** = [Scenario ED LO Post-Comp. Tax] + [Scenario ED Perm Post-Comp. Tax]

Final Output Calculations

- **Scenario Imposed Tax** = [Scenario GG Total Post-Comp. Tax] + [Scenario ED Total Post-Comp. Tax] + [Scenario UNL Total Tax]
- **Scenario Compression Amount** = [Scenario Extended Tax] - [Scenario Imposed Tax]

Control Calculation Logic

Property-Level Level of Detail (LOD) Calculations

- **Control Prop Simulated Tax Year** = {FIXED [Quick Ref ID] : MIN([Control Simulated Tax Year])}
- **Control Prop RMV Growth Rate** = {FIXED [Quick Ref ID] : MIN([Control RMV Growth Rate])}

None of the other property-level LOD calculations since the only two applied parameters are Simulated Tax Year and RMV Growth Rate.

Core Simulated Values

- **Control Simulated MAV (Control Simulated MAV)**
= [Prop MAV] * POWER ((1.03), ([Control Prop Simulated Tax Year] - [Prop Tax Year]))
- **Control Simulated RMV (Control Simulated RMV)**
= IIF([Control Prop Simulated Tax Year] > [Prop Tax Year], [Prop Total RMV] * POWER((1.0 + [Control Prop RMV Growth Rate]), ([Control Prop Simulated Tax Year] - [Prop Tax Year])), [Prop Total RMV])
- **Control Simulated AV (Control Simulated AV)**
= MIN([Control Simulated MAV], [Control Simulated RMV])

Compression Caps

- **Control GG Comp. Cap** = [Control Simulated RMV] * 0.01
- **Control ED Comp. Cap** = [Control Simulated RMV] * 0.005

Billing Rates

No row-level added rates since those calculations were only for the purpose of enabling the added rate feature and its associated parameters.

- **Control GG LO Billing Rate**
= {FIXED [Quick Ref ID] : SUM(IIF([M5 Category] = "GG" AND [Levy Type] = "LO", [Billing Rate], 0))}
- **Control GG Perm Billing Rate**
= {FIXED [Quick Ref ID] : SUM(IIF([M5 Category] = "GG" AND ([Levy Type] = "P" OR [Levy Type] = "PE" OR [Levy Type] = "QP"), [Billing Rate], 0))}
- **Control ED LO Billing Rate**
= {FIXED [Quick Ref ID] : SUM(IIF([M5 Category] = "ED" AND [Levy Type] = "LO", [Billing Rate], 0))}
- **Control ED Perm Billing Rate**
= {FIXED [Quick Ref ID] : SUM(IIF([M5 Category] = "ED" AND ([Levy Type] = "P" OR [Levy Type] = "PE" OR [Levy Type] = "QP"), [Billing Rate], 0))}
- **Control UNL Billing Rate**
= {FIXED [Quick Ref ID] : SUM(IIF([M5 Category] = "UNL", [Billing Rate], 0))}

Pre-Compression Taxes

- **Control GG LO Pre-Comp. Tax** = ([Control GG LO Billing Rate] / 1000) * [Control Simulated AV]
- **Control GG Perm Pre-Comp. Tax** = ([Control GG Perm Billing Rate] / 1000) * [Control Simulated AV]
- **Control GG Total Pre-Comp. Tax** = [Control GG LO Pre-Comp. Tax] + [Control GG Perm Pre-Comp. Tax]
- **Control ED LO Pre-Comp. Tax** = ([Control ED LO Billing Rate] / 1000) * [Control Simulated AV]

- **Control ED Perm Pre-Comp. Tax** = ([Control ED Perm Billing Rate] / 1000) * [Control Simulated AV]
- **Control ED Total Pre-Comp. Tax** = [Control ED LO Pre-Comp. Tax] + [Control ED Perm Pre-Comp. Tax]
- **Control UNL Total Tax** = ([UNL Billing Rate] / 1000) * [Simulated AV]
- **Control Extended Tax** = [Control GG Total Pre-Comp. Tax] + [Control ED Total Pre-Comp. Tax] + [Control UNL Total Tax]

Compression Logic

- **Control GG Total Compression Amount** = MAX(0, ([Control GG Total Pre-Comp. Tax] - [Control GG Comp. Cap]))
- **Control GG LO Reduction** = MIN([Control GG Total Compression Amount], [Control GG LO Pre-Comp. Tax])
- **Control GG Remaining Comp. Amount** = [Control GG Total Compression Amount] - [Control GG LO Reduction]
- **Control GG Perm Reduction** = MIN([Control GG Remaining Comp. Amount], [Control GG Perm Pre-Comp. Tax])
- **Control ED Total Compression Amount** = MAX(0, [Control ED Total Pre-Comp. Tax] - [Control ED Comp. Cap])
- **Control ED LO Reduction** = MIN([Control ED Total Compression Amount], [Control ED LO Pre-Comp. Tax])
- **Control ED Remaining Comp. Amount** = [Control ED Total Compression Amount] - [Control ED LO Reduction]
- **Control ED Perm Reduction** = MIN([Control ED Remaining Comp. Amount], [Control ED Perm Pre-Comp. Tax])

Post-Compression and Final Output Calculations

Post-Compression Tax

- **Control GG LO Post-Comp. Tax** = [Control GG LO Pre-Comp. Tax] - [Control GG LO Reduction]
- **Control GG Perm Post-Comp. Tax** = [Control GG Perm Pre-Comp. Tax] - [Control GG Perm Reduction]

- **Control GG Total Post-Comp. Tax** = [Control GG LO Post-Comp. Tax] + [Control GG Perm Post-Comp. Tax]
- **Control ED LO Post-Comp. Tax** = [Control ED LO Pre-Comp. Tax] - [Control ED LO Reduction]
- **Control ED Perm Post-Comp. Tax** = [Control ED Perm Pre-Comp. Tax] - [Control ED Perm Reduction]
- **Control ED Total Post-Comp. Tax** = [Control ED LO Post-Comp. Tax] + [Control ED Perm Post-Comp. Tax]

Final Output Calculations

- **Control Imposed Tax** = [Control GG Total Post-Comp. Tax] + [Control ED Total Post-Comp. Tax] + [Control UNL Total Tax]
- **Control Compression Amount** = [Control Extended Tax] - [Control Imposed Tax]

Analysis and Comparison Metric Calculations

- **Select Geographic View:** This parameter allows users to switch between viewing commissioner districts and residential neighborhoods.
 - Commissioner Districts
 - Residential Neighborhoods
- **Selected Geometry:** To enable dynamic switching of the geographic view of the map visualizations.


```
= IF [Select Geographic View] = "Commissioner District" THEN
[Geometry (Comm Dist)]
ELSEIF [Select Geographic View] = "Residential Neighborhood" THEN
[Geometry (Neighborhood)]
END
```
- **Selected Area:** To enable dynamic data aggregation and tooltip display.


```
= IF [Select Geographic View] = "Commissioner District" THEN
[DISTRICT]
ELSEIF [Select Geographic View] = "Residential Neighborhood" THEN
[NBODesc]
END
```
- **Difference in Extended Tax (%):**

```
= IF SUM([C Extended Tax]) = 0 OR ISNULL(SUM([C Extended Tax]))
```

```

THEN NULL
ELSE (SUM([Extended Tax]) - SUM([C Extended Tax])) / SUM([C
Extended Tax]) * 100
END

```

- **Difference in Imposed Tax (%):**

```

= IF SUM([C Imposed Tax]) = 0 OR ISNULL(SUM([C Imposed Tax]))
THEN NULL
ELSE (SUM([Imposed Tax]) - SUM([C Imposed Tax])) / SUM([C Imposed
Tax]) * 100
END

```

- **Difference in Compression Amount (%):**

```

= IF SUM([C Compression Amount]) = 0 OR ISNULL(SUM([C Compression
Amount]))
THEN NULL
ELSE (SUM([Compression Amount]) - SUM([C Compression Amount])) /
SUM([C Compression Amount]) * 100
END

```

- **Difference in GG Compression Amount (%):**

```

= IF SUM([C GG Total Needed Comp. Amount]) = 0 OR ISNULL(SUM([C
GG Total Needed Comp. Amount]))
THEN NULL
ELSE (SUM([GG Total Needed Comp. Amount]) - SUM([C GG Total
Needed Comp. Amount])) / SUM([C GG Total Needed Comp. Amount]) *
100
END

```

- **Difference in ED Compression Amount (%):**

```

= IF SUM([C ED Total Needed Comp. Amount]) = 0 OR ISNULL(SUM([C
ED Total Needed Comp. Amount]))
THEN NULL
ELSE (SUM([ED Total Needed Comp. Amount]) - SUM([C ED Total
Needed Comp. Amount])) / SUM([C ED Total Needed Comp. Amount]) *
100
END

```

- **Difference in Average Imposed Tax (%):**

```

= IF AVG([Control Imposed Tax]) = 0 OR ISNULL(AVG([Control
Imposed Tax]))
THEN NULL
ELSE (AVG([Scenario Imposed Tax]) - AVG([Control Imposed Tax])) /
AVG([Control Imposed Tax]) *100

```

- END
- **Difference in Average Compression Amount (%):**
 = IF AVG([Control Compression Amount]) = 0 OR ISNULL(AVG([Control Compression Amount]))
 THEN NULL
 ELSE (AVG([Scenario Compression Amount]) - AVG([Control Compression Amount])) / AVG([Control Compression Amount]) * 100
 END
- **Scenario AV/RMV Ratio:** [Simulated AV] / [Simulated RMV]
- **Control AV/RMV Ratio:** [C Simulated AV] / [C Simulated RMV]
- **Difference in Average AV/RMV Ratio (%):**
 = IF AVG([C AV/RMV Ratio]) = 0 OR ISNULL(AVG([C AV/RMV Ratio]))
 THEN NULL
 ELSE (AVG([AV/RMV Ratio]) - AVG([C AV/RMV Ratio])) / AVG([C AV/RMV Ratio]) * 100
 END
- **Scenario Imposed as a Percent of RMV (Imposed as % RMV):** [Imposed Tax] / [Simulated RMV]
- **Control Imposed as a Percent of RMV (Control Imposed as % RMV):** [C Imposed Tax] / [C Simulated RMV]
- **Difference in Average Imposed as a Percent of RMV (Difference in Avg Imposed Tax as % RMV (%)):**
 = IF AVG([C Imposed as % RMV]) = 0 OR ISNULL(AVG([C Imposed as % RMV]))
 THEN NULL
 ELSE (AVG([Imposed as % RMV]) - AVG([C Imposed as % RMV])) / AVG([C Imposed as % RMV]) * 100
 END
- **Property Type Segments:** To segment property types for property type visualization.
 = IF [Prop Type] = "RES" THEN "RES"
 ELSEIF [Prop Type] = "COM" THEN "COM"
 ELSEIF [Prop Type] = "PP" THEN "PP"
 ELSE "Other"
 END
- **AV Policy Choice Description**

```

= IF [Prop AV Policy Choice] = "Current Policy"
THEN "AV is determined as the lesser of the Simulated MAV or
Simulated RMV, reflecting existing Oregon law."
ELSEIF [Prop AV Policy Choice] = "AV = % of RMV"
THEN "Allows users to simulate a policy where AV is set to a
fixed percentage of the Simulated RMV."
ELSEIF [Prop AV Policy Choice] = "AV >= % of RMV"
THEN "Provides a floor for AV, where it's the greater of the
Current Policy AV or a specified percentage of Simulated RMV."
END

```

For Tooltips:

- **Area Category Text:**

```

= IF [Select Geographic View] = "Commissioner District" THEN
"District"
ELSEIF [Select Geographic View] = "Residential Neighborhood" THEN
"Neighborhood"
END

```

- **Property Type Footnote Text**

```

= IF [Property Type Segments] = 'Other'
THEN "'Other' includes Billboard (BB), Floating Real Property
(FLT), Industrial Local (IND), Industrial Leasehold Improvements
(LHI), Manufactured Structures (M), Industrial Machinery &
Equipment (ME), Mobile Home Park (MHP), Moorage (MRG), Personal
Property Industrial (PPI), Industrial State (SIND), and Utilities
(U)"
ELSE ""
END

```

- **Formatted Scenario Imposed Tax:** To decouple Scenario Imposed Tax formatting in tooltip versus axis for Imposed Tax by Property Type Visualization (complex logic in order to enable thousands comma separators)

```

= // First, round the number to ensure no decimals for whole
dollar amounts // Then, convert to integer to simplify string
manipulation // Handling positive and negative numbers separately
is good practice if negatives are possible IF SUM([Scenario
Imposed Tax]) >= 0 THEN // Positive numbers IF SUM([Scenario
Imposed Tax]) >= 1000000000 THEN // Billions '$' +
STR(FLOOR(SUM([Scenario Imposed Tax])/1000000000)) + ',' +
RIGHT('000' + STR(FLOOR((SUM([Scenario Imposed

```

```

Tax]))%1000000000)/1000000)), 3) + ',' + RIGHT('000' +
STR(FLOOR((SUM([Scenario Imposed Tax]))%1000000)/1000)), 3) + ',' +
+ RIGHT('000' + STR(FLOOR(SUM([Scenario Imposed Tax]))%1000)), 3)
ELSEIF SUM([Scenario Imposed Tax]) >= 1000000 THEN // Millions
'$' + STR(FLOOR(SUM([Scenario Imposed Tax])/1000000)) + ',' +
RIGHT('000' + STR(FLOOR((SUM([Scenario Imposed
Tax]))%1000000)/1000)), 3) + ',' + RIGHT('000' +
STR(FLOOR(SUM([Scenario Imposed Tax]))%1000)), 3) ELSEIF
SUM([Scenario Imposed Tax]) >= 1000 THEN // Thousands '$' +
STR(FLOOR(SUM([Scenario Imposed Tax])/1000)) + ',' + RIGHT('000'
+ STR(FLOOR(SUM([Scenario Imposed Tax]))%1000)), 3) ELSE // Less
than a thousand '$' + STR(FLOOR(SUM([Scenario Imposed Tax]))) END
ELSE // For negative numbers (optional, if your data can have
them) // You might want to handle negative numbers by taking the
absolute value, formatting, and then prepending "-" '-$' + ( IF
ABS(SUM([Scenario Imposed Tax])) >= 1000000000 THEN
STR(FLOOR(ABS(SUM([Scenario Imposed Tax]))/1000000000)) + ',' +
RIGHT('000' + STR(FLOOR((ABS(SUM([Scenario Imposed
Tax]))%1000000000)/1000000)), 3) + ',' + RIGHT('000' +
STR(FLOOR((ABS(SUM([Scenario Imposed Tax]))%1000000)/1000)), 3) +
',' + RIGHT('000' + STR(FLOOR(ABS(SUM([Scenario Imposed
Tax]))%1000)), 3) ELSEIF ABS(SUM([Scenario Imposed Tax])) >=
1000000 THEN STR(FLOOR(ABS(SUM([Scenario Imposed Tax]))/1000000))
+ ',' + RIGHT('000' + STR(FLOOR((ABS(SUM([Scenario Imposed
Tax]))%1000000)/1000)), 3) + ',' + RIGHT('000' +
STR(FLOOR(ABS(SUM([Scenario Imposed Tax]))%1000)), 3) ELSEIF
ABS(SUM([Scenario Imposed Tax])) >= 1000 THEN
STR(FLOOR(ABS(SUM([Scenario Imposed Tax]))/1000)) + ',' +
RIGHT('000' + STR(FLOOR(ABS(SUM([Scenario Imposed Tax]))%1000)),
3) ELSE STR(FLOOR(ABS(SUM([Scenario Imposed Tax]))) END ) END

```

For stylistic purposes for the Stacked Bar Chart visualization:

- **Control Column:** "Control"
- **Scenario Column:** "Scenario"
- **Max Ext for Axis:** MAX(SUM([Extended Tax]), SUM([C Extended Tax]))

Replacing Datasets

Each year, new datasets should be requested from DART in order to update the Scenario Lab with the most recent and accurate data. Upon following the Tableau Prep documentation to create new annual datasets, you will need to create a new packaged workbook of the Scenario Lab. Below are a list of steps to achieve this and potential issues to troubleshoot during this process.

1. **Renaming Fields:** Before uploading, look for fields with an extra 1 at the end (usually a leftover naming convention from the Prep file, as join fields that are not removed or renamed will populate with a number to distinguish identical fields). To the best of your ability, rename fields in the current version to match field names in your new dataset to prepare for smooth data integration.
2. **Uploading New Data:** In the current version of the Scenario Lab, click New Data Source under the Data tab and upload your new data extract saved from Tableau Prep.
3. **Replacing Old Data:** Open any Sheet from the dashboard and click Replace Data Source under the Data tab. It should automatically populate the datasets in the popup with the original dataset in the “Current” dropdown and the new dataset in the “Replacement” dropdown. *Do not select “Replace current worksheet only” as you want to change the dataset for the entire dashboard.*
4. **Replacing References for Invalid Fields:** Upon loading in new data, it is likely that the sheet will not display properly and a few fields will have duplicates and/or be invalid, indicated by a red exclamation point in the data pane. To resolve this, right click an invalid field and select “Replace References.” Search for the corresponding field and select “Okay”. This will map the invalid field from the old dataset to the values in the new dataset.
5. **Troubleshooting:** It is possible that some calculated fields or the Rate Selected Levy Code(s) set will be invalid when replacing data. Edit these calculated fields to see what fields are causing the issue. There are two options for troubleshooting in this case: First, exit the workbook without saving to restart your progress and rename these fields to match your new dataset before replacing data; second, reroute to the new fields in the Edit Calculated Field pane after replacing data.
6. **Save a new Scenario Lab:** After successfully replacing the data, click Save As and rename the dashboard with the current year to create a new packaged workbook for the Scenario Lab.

Further Work and Refinements

There are several areas where continued work and refinement is needed for the tool to be polished.

DART Data Request: Levy Code Grouping Spatial Join

A data request should be made to DART to do a spatial join to formally and accurately give us the levy code groupings since currently they were done manually using the ArcGIS tool on DART's website. This way the groupings and their levy codes are accurate and allows all of our data to continue to be from one source of truth.

Levy Code Grouping Feature

My goal was to enhance the "Simulate Adding a New Rate" feature in the Property Tax Modeling Tool by allowing users to select predefined groups of levy codes (e.g., "City of Portland," "Portland School District") instead of manually selecting individual codes from a Tableau Set. This aims to drastically improve the user interface and user experience (UI/UX).

Implementation Steps (Approach 1):

1. **Select Levy Code Group Parameter Creation:** A new parameter, **Select Levy Code Group**, was created. This parameter allows users to choose between "Individual Selection" and various predefined levy code groups.
2. **Is Selected Levy Code Group Calculated Field:** A large calculated field named **Is Selected Levy Code Group** was developed. This field utilizes a **CASE** statement to determine if a given **[Levy Code1]** belongs to the group currently selected in the **Select Levy Code Group** parameter. The logic uses extensive **OR** conditions to include all relevant levy codes for each group, treating the codes as numbers since **[Levy Code1]** is a Number (Whole) data type. The entire **CASE** statement was wrapped with **IFNULL(..., FALSE)** to ensure it always returns a definitive boolean (TRUE or FALSE).
3. **Final Rate Levy Code Selection Field:** A calculated field named **Final Rate Levy Code Selection** was created. This field dynamically switches between using the **Is Selected Levy Code Group** logic (for group selections) and the original **[Rate Selected Levy Code(s)]** Tableau Set (for individual selections).
4. **Modification of "Row-Level Added Rates" Calculations:** Existing "Row-Level Added Rates" calculations (e.g., **Scenario GG L0 Added Rate (Row)**) were modified to use **Final Rate Levy Code Selection** as their primary condition for applying the simulated new tax rate.
5. **Dynamic Visibility of Set Control:** Dynamic visibility was set up on the dashboard for the original **[Rate Selected Levy Code(s)]** Set control, ensuring it only appears when "Individual Selection" is chosen in the **Select Levy Code Group** parameter.

Error Encountered: "Error: Expected type boolean, found invalid type. Comparison in 'IF' expression must be boolean type"

Following the implementation of the levy code grouping, a persistent error began appearing in the "Difference in..." calculated fields, such as `Difference in Compression Amount (%)`.

Initial Troubleshooting Steps (Unsuccessful in Resolving the Core Issue):

- The initial thought was that the error might be related to `SUM([Control Compression Amount])` (and similar measures) not returning a valid numeric type for comparison.
- Attempts were made to use `ZN()` to handle potential nulls.
- The code was reverted to previous states to isolate the issue.
- It was suspected that underlying data quality issues (e.g., non-numeric values, NaN, or errors propagating from earlier calculations like `[Control Extended Tax]` or `[Control Imposed Tax]`) might be the cause.
- The `Is Selected Levy Code Group` calculation was broken down into multiple, smaller calculated fields, with each levy code group's boolean logic separated into its own field, and the main `Is Selected Levy Code Group` field referencing these new boolean fields. This was done to reduce complexity and avoid the "expression is too complex" error, which was appearing when trying to refine the larger calculations.

Current Status:

Despite the efforts to simplify the `Is Selected Levy Code Group` calculation and its dependencies, the "Expected type boolean, found invalid type" error persists in the "Difference in..." calculations. This indicates that the core issue of `SUM([Control Compression Amount])` (and related aggregates) not consistently returning a valid numeric type remains unresolved, and further investigation into the origin of `NULL`s or non-numeric values propagating through the calculation chain is required.

Taxing District Filtering

Another enhancement involves adding a filter to allow users to refine their analysis by common taxing districts (as outlined in the levy code guide) or, as a last resort alternative, directly by levy code. This will provide more granular control over the data displayed, tailoring the tool to users like City of Portland economist Peter Hulseman and other taxing district leaders who want data filtered to their districts.

Dynamic Action Filters

Ongoing work is dedicated to thoroughly testing and validating the dynamic Action filters within the tool (the filters that allow the user to click on property type or neighborhood or district within a visualization and have all other visualizations be filtered on that), addressing any observed anomalies during the QA process. Ensuring their robust functionality is a priority for future enhancements.

Practical Applications & Analysis Guide

This section is designed to bridge the gap between understanding the Property Tax Modeling Project's mechanics and effectively applying it to real-world policy questions. Here, you will find practical examples and best practices for leveraging the simulation capabilities to explore various "what-if" scenarios, analyze potential reforms to Oregon's property tax system, and gain deeper insights into their financial implications for both taxing districts and homeowners. By working through these examples, you'll develop a stronger understanding of how to translate policy ideas into actionable simulations and interpret the resulting data to inform decision-making.

Modeling Policy Scenarios (How-To Guide)

This section provides step-by-step examples for answering common policy questions using the simulation tool.

Example A: New Levy for Gresham

- **Policy Question:** What is the estimated revenue and compression impact of a new local option library levy of \$0.25 per \$1,000 of Assessed Value, specifically applied to parts of NE Portland?
- **Parameter Settings:**
 - **Billing Rate (\$ per \$1000 AV):** Set to 0.25.
 - **Rate Levy Type:** Set to LO (Local Option).
 - **Rate Measure 5 Category:** Set to GG (General Government).
 - **Rate Selected Levy Code(s):** Select '026' '047' '137' '383' '386' '394' '402' '901' '902' '903' '904'
- **Key Metrics to Analyze and Visualizations:**
 - Total Revenue Impact
 - Metric: Difference in Imposed Tax (%)
 - Visualizations:
 - County Tax Revenue: Control vs. Scenario Policies
 - Impact on Imposed Tax
 - Compression Impact

- Metric: Difference in Compression Amount (%)
 - Visualizations:
 - County Tax Revenue: Control vs. Scenario Policies
 - Impact on Amount Compressed
- Impact by Property Type
 - Visualization: Impact on Imposed Tax by Property Type

Example B: Bringing AV Closer to RMV

- **Policy Question:** How would setting Assessed Value (AV) to be at least 80% of Real Market Value (RMV) impact property tax burdens and the overall AV/RMV ratio?
- **Parameter Settings:**
 - **AV Policy Choice:** Select "AV >= % of RMV."
 - **% of RMV for AV Minimum:** Set to 80%.
- **Key Metrics to Analyze and Visualizations:**
 - Homeowner Tax Burden
 - Metric: Difference in Average Imposed as a Percent of RMV (%)
 - Visualization: Impact on Real Tax Burden
 - AV/RMV Ratio
 - Metric: Difference in Average AV/RMV Ratio (%)
 - Visualization: Impact on the Difference Between Taxable and Market Values
 - Total Revenue Impact
 - Metric: Difference in Imposed Tax (%)
 - Visualizations:
 - County Tax Revenue: Control vs. Scenario Policies
 - Impact on Imposed Tax

Example C: Increasing the MAV Growth Rate

- **Policy Question:** How would increasing the annual Maximum Assessed Value (MAV) growth cap from 3% to 4% affect tax burdens and the Assessed Value (AV)/Real Market Value (RMV) ratio over five years?
- **Parameter Settings:**
 - **Simulated Tax Year:** Set to five years from the base year (e.g., if the base year is 2024, set to 2029).
 - **MAV Growth Rate (per year):** Change from 3% to 4%.
- **Key Metrics to Analyze and Visualizations:**
 - AV/RMV Ratio
 - Metric: Difference in Average AV/RMV Ratio (%)
 - Visualization: Impact on the Difference Between Taxable and Market Values
 - Total Revenue Impact

- Metric: Difference in Imposed Tax (%)
- Visualizations:
 - County Tax Revenue: Control vs. Scenario Policies
 - Impact on Imposed Tax

Example D: Raising the General Government Compression Cap

- **Policy Question:** What would be the impact on collected revenue and the amount of compression if the constitutional limit for General Government taxes (GG Compression Rate) were increased from 1% of RMV to 2% of RMV?
- **Parameter Settings:**
 - **GG Compression Rate:** Change from 1% to 2%.
- **Key Metrics to Analyze and Visualizations:**
 - Compression Impact
 - Metrics:
 - Difference in Compression Amount (%)
 - Difference in GG Compression Amount (%)
 - Visualizations:
 - County Tax Revenue: Control vs. Scenario Policies
 - Impact on Amount Compressed
 - Total Revenue Impact
 - Metric: Difference in Imposed Tax (%)
 - Visualizations:
 - County Tax Revenue: Control vs. Scenario Policies
 - Impact on Imposed Tax

Conducting Sensitivity Analysis

The accuracy of any forecast depends on the accuracy of its underlying assumptions. This section explains how to test the model's sensitivity to its most critical and unpredictable variable: Real Market Value (RMV) Growth Rate.

The Challenge: Future RMV growth is highly uncertain and has a significant impact on projected tax revenues and compression.

Recommended Approach: *Range-Based Testing*

- **Run a Baseline Case:** Run your primary policy scenario using the default RMV Growth Rate (per year) of 5.8%.
- **Run a Pessimistic Case:** Rerun the same scenario with a lower growth rate (e.g., 2.0%).
- **Run an Optimistic Case:** Rerun the scenario with a higher growth rate (e.g., 8.0%).

Best Practice: By comparing the results from these three runs, you can determine a potential range of financial outcomes for your policy scenario. Any formal analysis or report based on this tool should present this range to reflect the uncertainty inherent in economic forecasting. This practice demonstrates analytical rigor and provides decision-makers with a more complete picture of potential impacts.