# *Introduction to Local Government Finance*Revenue Forecasting: Hands on with Property Taxes!

**Formula-Based Projections**

**Step 1:** Open up the blank Excel spreadsheet.

**Step 2:** Create the formula. Here, the formula is for property taxes:
Forecast= (Assessed Value)/100 \* Tax rate \* Collection rate

In Excel, type in the following (the quotation marks should not be included—only the text/numbers): “=((12421490.88)/100)\*0.52\*0.97”

This formula, once entered, will then display as the answer to that equation. It will be 62654. This is the forecast for the next fiscal year.

*Tip 1:* “=” tells Excel that you are inputting a formula.

*Tip 2:* Make sure you get your parentheses correct. They signal to Excel the order that should be used to calculate the equations.

# Simple Moving Averages

**Step 1:** Open up the Excel spreadsheet with the data included.

**Step 2:** Click “Data Analysis” under the “Tools” tab. If you do not have this option, then you need to install it as an add-in. To do that, go to the “File” tab and click “Options.” Under “Options” go to “Add- ins.” Under “Add-ins” select “Analysis ToolPak.” Restart Excel; “Data Analysis” will now be an option under the “Data” tab.

**Step 3:** Choose “Moving Average” from the ToolPak menu.

**Step 4:** Highlight the previous year’s tax revenue as the input range. Then input the interval, i.e., how many years do you want the moving average to cover? Next, highlight the cells for which you want the output to be presented. The final number in the sequence is the forecast for next year.

*Tip 3:* You can also use the formula presented in the *Introduction to Local Government Finance* book. Input it much like the formula-based projections. This is just another option.

*Tip 4:* For the output range, start one year in—here, our data begins in 2005, so start the output range in 2006. That way, the final-year forecast will align with the actual year.

*Tip 5:* If you get a message saying “#N/A,” this means that the program did not have enough data to compute the moving average. You will see that with the same data, short intervals will have fewer #N/As because the software will be able to compute earlier forecasts.

# Arithmetic Mean Return

**Step 1:** Open up the Excel spreadsheet with the data included.

**Step 2:** Calculate the percentage changes from year to year. To do this, divide year 2 by year 1, then year 3 by year 2, etc. For example, 2006’s property tax is 55546 and 2005’s is 48333. The formula would be “=55546/48333.” This will give you a result of 1.149. This is interpreted as there was 14.9% growth between 2005 and 2006 (or that the value for 2006 is 114.9% of 2005). Do this for every year.

**Step 3:** Calculate the average growth rate. You can do this by adding all of the growth rates together and then dividing them by your window (number of years) or by using the average function. For the latter, type “=AVERAGE(” then highlight the growth rates you have created and put a “)” at the end. Here, for our seven-year window, the average will give you 1.045 or a 4.5% growth rate.

**Step 4:** Multiply the growth rate by the previous year’s tax revenue to calculate the current year’s expected revenue. Here, that would be “=1.045\*62654”, which will give you 65497.

*Tip 6:* To create these formulas, you can also just click on the cell with the number you want and use the cell number instead of typing out the value. Then you can drag your formulas across the row (as laid out in the downloadable Excel spreadsheet). So, for example, 2006 growth rate is “=C8/B8” in the Excel example I am using.

*Tip 7:* The growth rates calculated in step 3 will typically give you a number around 1. A number above 1 means positive growth in tax revenue. A number below 1 means loss in tax revenue.

# Univariate Regression

**Step 1:** Open up the Excel spreadsheet with the data included.

**Step 2:** Click “Data Analysis” under the “Tools” tab. Select “Regression.”

**Step 3:** For the Y range, highlight the revenues.

**Step 4:** For the X range, highlight the years.

**Step 5:** Highlight the cell for the output. It will give you quite a bit of output, so do not choose something that will overlap any data and erase it.

**Step 6:** Hit the “OK” button.

**Step 7:** Calculate the revenue forecast. To do this, add the intercept that is given in the output (here,
-4390393.286) and the total of the year you are forecasting (here, 2012) plus the X variable intercept (here, 2215.714286). The equation in Excel, if you are inputting the numbers and not highlighting cells, will be “=-4390393.286+(2012\*2215.714286).” This will give you the forecast for 2012, which is 67623.857.

*Tip 8:* The output gives you a lot of information you are not going to use. One other element of the output may be helpful, though. Under the “Regression Statistics” bar, the R-Square is reported. It will be between 0 and 1. A value closer to 1 means that your model is working well and is explaining the changes in revenue well.

# Causal Modeling

**Step 1:** Open up the Excel spreadsheet with the data included.

**Step 2:** Click “Data Analysis” under the “Tools” tab. Select “Regression.”

**Step 3:** For the Y range, highlight the revenues.

**Step 4:** For the X range, highlight the years and whatever other variables you are using, for example, population and unemployment.

**Step 5:** Highlight the cell for the output. It will give you quite a bit of output, so do not choose something that will overlap any data and erase it.

**Step 6:** Hit the “OK” button.

**Step 7:** Calculate the revenue forecast. To do this, add the intercept that is given in the output (here,
-5783715.383) and the total of the year you are forecasting (here, 2012) plus the X variable intercept (here, 2975.445). For the other variables you are using, for example, x2 (population) and x3 (unemployment), you will need a forecast of what their values will be in the year being forecast.