Combining Excel and Python
Using `xlwings` to Run Excel from Python

Nick DeRobertis[1]

[1]University of Florida
Department of Finance, Insurance, and Real Estate

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Leveraging the Power of Both Tools

- We have learned how to use both Excel and Python to solve problems. Throughout this process, there were advantages and disadvantages of each tool for each problem.

- I wanted you to know both tools so you could pick whichever is best to tackle your problem

- For larger problems, you'll likely find some parts are better with Excel and some with Python

- After this lecture, you won't need to choose one anymore, you can use both at once.

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How Far does pandas Get Us?

- pandas has built-in tools for working with Excel

- pandas can read Excel workbooks into DataFrames and it can write DataFrames back to Excel workbooks

- For simple uses, this may be enough. If you just need to get data from somewhere once and put it in your workbook, or you have your data in Excel and want to analyze it in Python, this is sufficient

- If you want to manipulate your workbook from Python, or you want to run Python code from your workbook, look to xlwings

Reading and Writing to Excel Files with `pandas`

Reading Excel Files

```
df = pd.read_excel('data.xlsx', sheet_name='My Data')
```

- If you don't pass a sheet name, it will take the first sheet.

Writing to Excel Files

```
df.to_excel('data.xlsx', sheet_name='My Data', index=False)
```

- We are passing index=False because usually the 0, 1, 2 ... index is not useful
- If you had set your index to something useful, then don't include `index=False`

Careful When Writing!

When `pandas` writes to a workbook, it replaces the file. Do not write over an existing workbook that you want to keep!

Showcasing Reading and Writing to Excel Files

Read and Write to Excel using pandas

- Download the contents of the "Read Write Excel Pandas" folder in Examples
- Ensure that you put the Excel file and notebook in the same folder for it to work
- Follow along with the notebook

Read Write Pandas Lab, Level 1

Reading and Writing to Excel with Pandas, Level 1

1. Download "MSFT Financials.xls" from the course site
2. Read the sheet "Income Statement" into a DataFrame
3. Write the DataFrame to a new workbook, "My Data.xlsx", with the sheet name "Income Statement"

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Introducing xlwings

- The easiest way to use Python
  from in Excel, or Excel from in
  Python, is xlwings

- In Windows, it's based off the
  Microsoft COM API, which is
  some common tools they give
  for creating plugins.

- It's still in active development,
  but overall it works pretty well
  and is far beyond where we were
  a few years ago

What are the Main Ways to use xlwings?

- There are two main ways to use xlwings

- You can **manipulate Excel from Python,** which gives you the full power of Excel from within Python. In this class we'll focus on reading and writing values, but you can do anything that you would normally be able to in Excel, but by executing Python code.

- Or you can **run Python from Excel** using one of two approaches: Python as a VBA replacement and user-defined functions (UDFs)

- We will focus on manipulating Excel from Python in this class. I encourage you to explore the other two approaches on your own.

Using Python to Drive Excel Models

- `xlwings` allows us to write Python values into Excel and fetch Excel values into Python

- There is also a complete VBA API, meaning you can do everything that you could do with VBA from within Python, which means you have the full capabilities of Excel within Python

- There are also convenient features to work with entire tables at once rather than a single value

Write and Read Values to and from Excel

Read Values from Excel

```python
my_value = sht.range("G11").value  # single value
# all values in cell range
my_value = sht.range("G11:F13").value
# expands cell range down and right getting all values
my_values = sht.range("G11").expand().value
```

Write Values to Excel

```python
sht.range("G11").value = 10
sht.range("G11").value = [10, 11]  # horizontal
sht.range("G11:G12").value = [10, 11]  # vertical
# table, DataFrame from elsewhere
sht.range("G11").value = df
```

How to Use xlwings

Trying out xlwings

- Download the contents of the "xlwings" folder in Examples
- Ensure that you put the Excel file and notebook in the same folder for it to work
- Follow along with the notebook

Read Write xlwings Lab, Level 1

Reading and Writing to Excel with xlwings, Level 1

1. For all of the xlwings lab exercises, work with "xlwings Lab.xlsx".
2. Use xlwings to read the values in the column A and then write them beside the initial values in column B

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                    Resources: Slide 23

Lecture Resources

Lecture Resources

1. Slides - Combining Excel and Python
2. Lecture Notes - Combining Excel and Python
3. Read Write Excel Pandas
4. MSFT Financials
5. Combining Excel and Python
6. Example Workbook
7. xlwings Lab

Read Write Pandas Lab, Level 2

Reading and Writing to Excel with Pandas, Level 2

1. Use the same "MSFT Financials.xls" from the first exercise
2. Output to five separate workbooks, named "My Data1.xlsx", "My Data2.xlsx", and so on.
3. Do this without writing the to_excel command multiple times

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Read Write Pandas Lab, Level 3

Reading and Writing to Excel with Pandas, Level 3

1. Note: this exercise uses the Advanced material covered in the example Jupyter notebook Read Write Excel Pandas.ipynb
2. Use the same "MSFT Financials.xls" from the first exercise
3. Output to five separate sheets in the same workbook "My Data.xlsx". The sheets should be named "Income Statement 1", "Income Statement 2", and so on.
4. Do this without writing the to_excel command multiple times

Level 1: Slide 8   Level 2: Slide 17   Resources: Slide 19

Read Write Pandas Lab Resources

Reading and Writing to Excel with Pandas Resources

1. Slides - Combining Excel and Python
2. MSFT Financials
3. Read Write Excel Pandas

Level 1: Slide 8   Level 2: Slide 17   Level 3: Slide 18

Read Write xlwings Lab, Level 2

Reading and Writing to Excel with xlwings, Level 2

1. Get the value in C9 and multiply it by 2.5 in Python

Read Write xlwings Lab, Level 3

Reading and Writing to Excel with xlwings, Level 3

1. Read the table which starts in E4 into Python. Multiply the prices by 2.5, and then output back into Excel starting in cell H5.

2. Ensure that the outputted table appears in the same format as the original (pay attention to index and header)

Read Write xlwings Lab, Level 4

Reading and Writing to Excel with xlwings, Level 4

1. In column L, write 5, 10, 15 ... 100 spaced two cells apart, so L1 would have 5, L4 would have 10, and so on.

Read Write xlwings Lab Resources

Reading and Writing to Excel with xlwings Resources

1. Slides - Combining Excel and Python
2. xlwings Lab

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Level 4: Slide 22