

Effective Programming Practices for Economists

Data management with pandas

DataFrames and Series

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What is a DataFrame

```
>>> df = pd.read_csv(path, engine="pyarrow")  
>>> df
```

| | country | continent | year | life_exp |
|---|---------|-----------|------|----------|
| 0 | Cuba | Americas | 2002 | 77.16 |
| 1 | Cuba | Americas | 2007 | 78.27 |
| 2 | Spain | Europe | 2002 | 79.78 |
| 3 | Spain | Europe | 2007 | 80.94 |

```
>>> df.columns
```

```
Index(['country', 'continent', 'year', 'life_exp'],  
      dtype='string')
```

```
>>> df.index
```

```
RangeIndex(start=0, stop=4, step=1)
```

- Tabular dataset, typically loaded from a file
- Two mental models:
 1. Matrix/Array with labels
 2. Dictionary of columns
- Can inspect index and column names

What is a Series?

```
>>> sr = df["country"]  
>>> type(sr)  
pandas.core.series.Series
```

```
>>> sr
```

```
0    Cuba  
1    Cuba  
2    Spain  
3    Spain  
Name: country, dtype: string
```

- Each column of a DataFrame is a Series
- Mental model: Vector with an index
- All entries in a Series have the same dtype

Creating DataFrames and Series

```
>>> df = pd.DataFrame(  
...     data=[[1, "bla"], [3, "blubb"]],  
...     columns=["a", "b"],  
...     index=["c", "d"]  
... )  
>>> df
```

| | a | b |
|---|---|-------|
| c | 1 | bla |
| d | 3 | blubb |

```
>>> pd.Series(  
...     [3.0, 4.5], index=["x", "y"],  
... )
```

```
x    3.0  
y    4.5  
dtype: float64
```

- Data for a DataFrame can be nested lists or similar things
- Columns and index can be ints, strings and tuples
- **Powerful strategy:** Whenever you learn pandas or debug problems, create tiny DataFrames and Series to gain better understanding

Assignment is index aligned!

We continue using df from before

```
>>> sr = pd.Series(  
...     [2.71, 3.14],  
...     index=["d", "c"],  
... )  
>>> df["new_col"] = sr
```

| | a | b | new_col |
|---|---|-------|---------|
| c | 1 | bla | 3.14 |
| d | 3 | blubb | 2.71 |

- New columns can be assigned with square brackets
- Index is automatically aligned!
 - Makes many things safer!
 - Can make pandas slow