

# **Effective Programming Practices for Economists**

## **Software engineering**

### **How to raise errors?**

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# Raising a built-in exception

```
def convert_lod_to_dol(lod):
    if not isinstance(lod, list):
        msg = f"lod must be a list, not {type(lod)}."
        raise TypeError(msg)
    # ...
```

```
>>> convert_lod_to_dol("hello")
```

```
-----
TypeError                                Traceback (most recent call last)
/home/janos/playground.ipynb Cell 17 line 1
----> 1 convert_lod_to_dol("hello")
```

```
/home/janos/playground.ipynb Cell 17 line 4
 2 if not isinstance(lod, list):
 3     msg = f"lod must be a list, not {type(lod)}."
----> 4     raise TypeError(msg)
```

```
TypeError: lod must be a list, not <class 'str'>.
```

- Errors are raised with the `raise` keyword
- You can add a custom message to the built-in exceptions

# Common built-in errors

- Python has hundreds of built-in exceptions
- You can get very far with two:
  - **TypeError**: An argument to your function has the wrong type
  - **ValueError**: An argument to your function has the correct type but a wrong value
- The full list is in the documentation

# fail functions

```
def convert_lod_to_dol(lod):  
    _fail_if_lod_is_not_a_list(lod)  
    # ...  
  
def _fail_if_lod_is_not_a_list(lod):  
    if not isinstance(lod, list):  
        msg = f"lod must be a list, not {type(lod)}."  
        raise TypeError(msg)
```

- It is a good idea to put each check into a separate `_fail` function
- Choose a long and descriptive name
- Define the function at the bottom of your module

# Collect errors before raising

```
def _fail_if_list_of_wrong_types(data):  
    invalid_rows = []  
    for i, row in enumerate(data):  
        if not isinstance(row, dict):  
            invalid_rows.append(i)  
  
    if invalid_rows:  
        report = "The following rows are not dictionaries:\n"  
        for i in invalid_rows:  
            report += f"    Row {i} has type {type(data[i])}\n"  
        raise TypeError(report)
```

- If you have multiple errors, it is annoying to solve them one by one
- If possible, collect multiple errors before raising
- Don't go too far!

# Raising a custom error

```
>>> class NonTabularDataError(Exception):
...     pass

>>> raise NonTabularDataError(
...     "The lists in dol have unequal length"
... )
```

```
-----
NonTabularDataError Traceback (most recent call last)
/home/janos/playground.ipynb Cell 18 line 4
      1 class NonTabularDataError(Exception):
      2     pass
----> 4 raise NonTabularDataError(
      5     "The lists in dol have unequal length"
      6 )
```

```
NonTabularDataError: The lists in dol have unequal length
```

- Defining a custom error means defining a class that inherits from Exception
- Trade-off
  - Built-in exceptions are familiar
  - Custom exceptions are more explicit