

# Effective Programming Practices for Economists

## Software engineering

### What does pytest do?

Janoś Gabler and Hans-Martin von Gaudecker

# Example

consider this hypothetical survey about a programming course

```
>>> raw = pd.read_csv("survey.csv")
>>> raw
```

	Q001	Q002	Q003
0	strongly disagree	agree	python
1	strongly agree	strongly agree	Python
2	-77	disagree	R
3	agree	-77	Python
4	-99	-99	Python
5	nan	strongly agree	Python
6	neutral	strongly agree	Python
7	disagree	agree	python
8	strongly disagree	-99	PYTHON
9	-77	-99	Ypthon

From the metadata you know

- Q001: I am a coding genius
- Q001: I learned a lot
- Q003: What is your favourite language
- -77 not readable
- -99 no reply

# Two functions in clean\_data.py

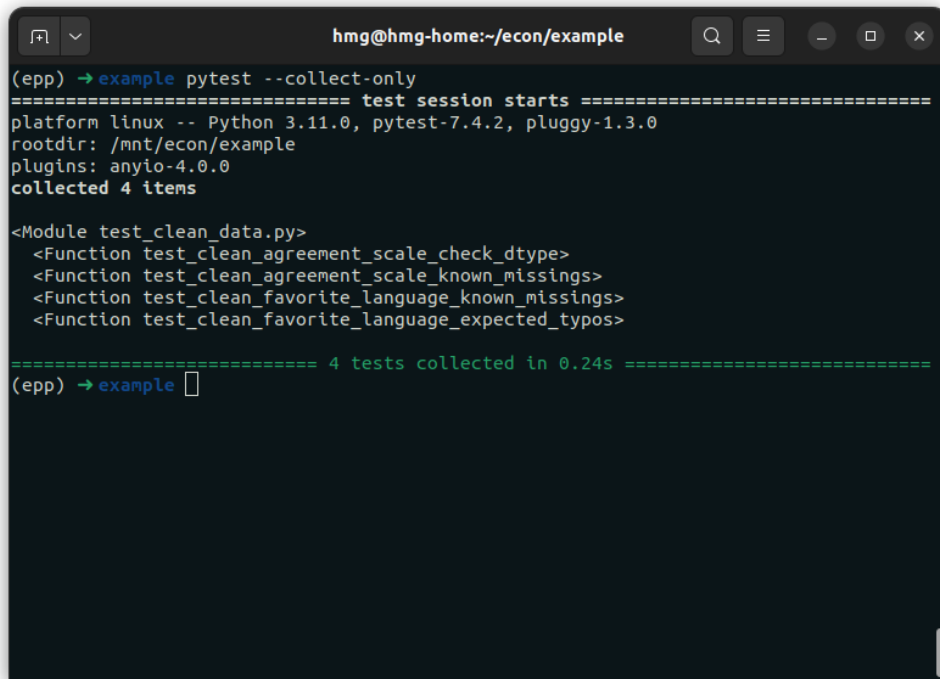
```
def _clean_agreement_scale(sr):  
    sr = sr.replace({"-77": pd.NA, "-99": pd.NA})  
    categories = ["strongly disagree", "disagree", "neutral", "agree", "strongly agree"]  
    dtype = pd.CategoricalDtype(categories=categories, ordered=True)  
    return sr.astype(dtype)  
  
def _clean_favorite_language(sr):  
    sr = sr.replace({"-77": pd.NA, "-99": pd.NA})  
    sr = sr.str.lower().str.strip()  
    sr = sr.replace("ypthon", "python")  
    return sr.astype(pd.CategoricalDtype())
```

# New module: `test_clean_data.py`

- 4 assertions whether actual results match our expectation
- Will look at syntax in subsequent screencast

# Step 1: Collection

- Go through all folders in working directory
- Collect all files with name ``test_XXX.py``
- Go through those files and collect all functions that start with ``test_``
- All these test functions will be executed (fine-grained control possible)

A terminal window with a dark background and light text. The title bar shows the user 'hmg' at 'hmg-home' in the directory '~/econ/example'. The prompt is '(epp)'. The user has entered '→ example pytest --collect-only'. The output shows the start of a test session, platform and version information, root directory, plugins, and that 4 items were collected. It then lists the module 'test\_clean\_data.py' and its four functions. Finally, it shows that 4 tests were collected in 0.24s. The prompt is now '(epp) → example' followed by a cursor.

```
hmg@hmg-home:~/econ/example

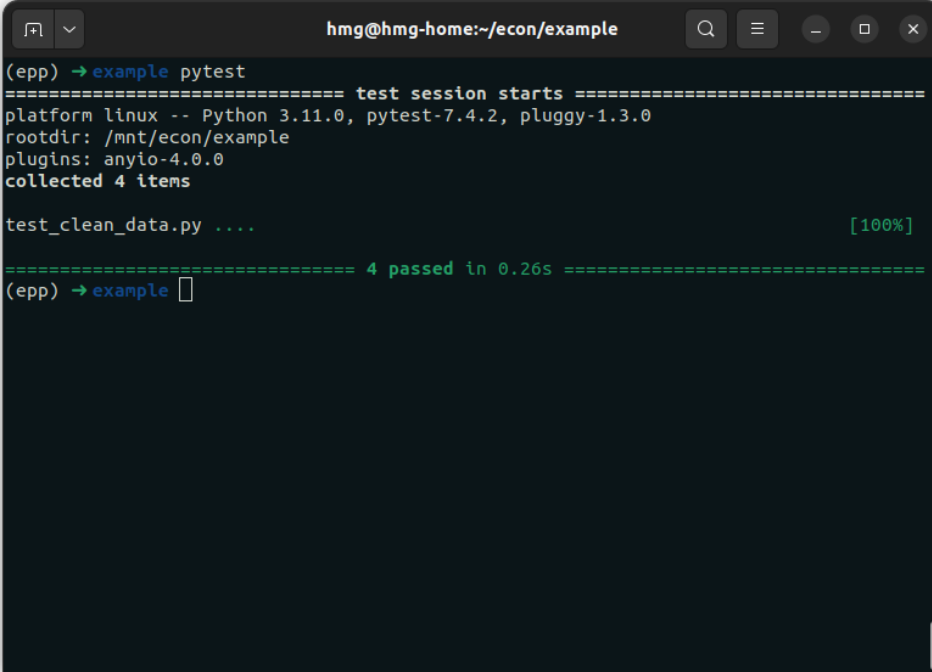
(epp) → example pytest --collect-only
===== test session starts =====
platform linux -- Python 3.11.0, pytest-7.4.2, pluggy-1.3.0
rootdir: /mnt/econ/example
plugins: anyio-4.0.0
collected 4 items

<Module test_clean_data.py>
  <Function test_clean_agreement_scale_check_dtype>
  <Function test_clean_agreement_scale_known_missings>
  <Function test_clean_favorite_language_known_missings>
  <Function test_clean_favorite_language_expected_typos>

===== 4 tests collected in 0.24s =====
(epp) → example
```

## Step 2: Execute the tests

- All test functions are executed
- A report is printed to the screen

A terminal window with a dark background. The title bar shows the user 'hmg' at 'hmg-home' in the directory '~/econ/example'. The prompt is '(epp)'. The user has entered '→ example pytest'. The output shows the start of a test session, including platform, Python version, pytest version, root directory, plugins, and collected items. It then shows the execution of 'test\_clean\_data.py' with a progress indicator '[100%]' and a final summary '4 passed in 0.26s'. The prompt returns to '(epp) → example'.

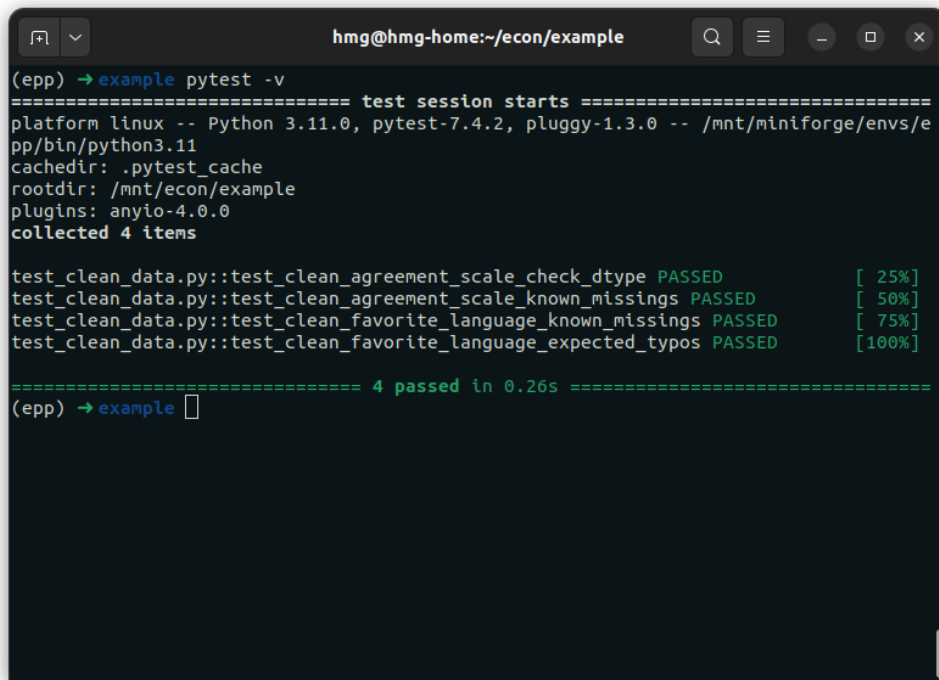
```
hmg@hmg-home:~/econ/example
(epp) → example pytest
===== test session starts =====
platform linux -- Python 3.11.0, pytest-7.4.2, pluggy-1.3.0
rootdir: /mnt/econ/example
plugins: anyio-4.0.0
collected 4 items

test_clean_data.py .... [100%]

===== 4 passed in 0.26s =====
(epp) → example
```

## Step 2: Execute the tests

- `pytest -v` gives more detailed progress reports
- Can be very helpful for long-running tests

A terminal window with a dark background and light text. The title bar shows the user 'hmg' at 'hmg-home' in the directory '~/econ/example'. The prompt is '(epp)'. The user has entered 'example pytest -v'. The output shows a detailed test session starting with platform information (Linux, Python 3.11.0, pytest 7.4.2, pluggy 1.3.0), cache and root directory paths, and plugins. It then lists 4 collected items. The test results show four tests from 'test\_clean\_data.py' all passing with progress indicators: 25%, 50%, 75%, and 100%. The session ends with '4 passed in 0.26s'.

```
hmg@hmg-home:~/econ/example

(epp) → example pytest -v
===== test session starts =====
platform linux -- Python 3.11.0, pytest-7.4.2, pluggy-1.3.0 -- /mnt/miniforge/envs/e
pp/bin/python3.11
cachedir: .pytest_cache
rootdir: /mnt/econ/example
plugins: anyio-4.0.0
collected 4 items

test_clean_data.py::test_clean_agreement_scale_check_dtype PASSED [ 25%]
test_clean_data.py::test_clean_agreement_scale_known_missings PASSED [ 50%]
test_clean_data.py::test_clean_favorite_language_known_missings PASSED [ 75%]
test_clean_data.py::test_clean_favorite_language_expected_typos PASSED [100%]

===== 4 passed in 0.26s =====
(epp) → example
```

## Step 3: Inspect failures





[illegible]