Python meeting
01: Initiation

15th April 2026

The Python Meeting will start soon

COURSE PYTHON SCHEDULE

01: 20250415, 10am: Initiation – Case-study: P02_15: Above average prices

- Set-up: Python, Visual Studio Code
- Project creation: Folder, .py, Virtual Environment, CMD
- Libraries: Import, requirements file
- Naming conventions
- Basic objects: Dataframe (table), Series (column), Variable, Function, Group_by
- Basic functions: Import, Rename, Filter, Join, Create columns, Group, Aggregate, Export

02: 20250422, 9am: Melt, split, for – Case-studies: D01: Trial balance, P01_19: Supplier debtors, O01_19: Customer creditors

- Using melt, split
- For loop

03: 20250429, 9am: Web-download – Case-study: P01_10: Suppliers in OFAC

- Request for downloading sanctions
- IO for encoding
- Regex for comparison
- Split, explode for row generation
- Levenshtein distance scoring

04: 20250506, 9am: JSON, expressions, rolling Window – Case-study: P02_19: Split POs

- Import JSON, Expression object for adding labels,
- cum_sum() for rolling window

05: 20250513, 9AM: zip, dynamic fields – Case-study: P02_03: PO whilst blocked

- Zip to group lists together
- Using dynamic fields in a for loop

09:00 – 09:05

COURSE PYTHON SCHEDULE

06: 20250520, 10am: Cumulative sum, dates – Case-study: P02_18: PO slow rotation

- cum_sum for calculating future or past inventory movements

07: 20250527, 9am: Isolation forest for unusual transactions – Case-study: Unusual bank transfers

- Using isolation forest library to score for unusual transactions

08: 20250603: 9am: SpaCy – Case-study: P01_11/ O01_11: Suppliers/ customers that are people

- Using SpaCy NLP object to categorize names

09: 20250610: 9am: Contract review – Case-study: Scoring of contracts

- Using Gemini model to check for paragraphs of similar meaning

10: 20250617: 9am: Open AI API – Case-study: Generating audit reports

- Using API to OpenAI to generate text for audit reports

11: 20250624: 10am: Regex and Sklearn matching – Case-study: HR03_12/ H403_13: Unusual T&E

- Using Regex and Sklearn to check for unexpected travel and expenses

12: 20250701: 9am: OCR: Image recognition – Case-study: HR03_14: Expenses for others

- Using OCR python library to read travel and expense receipts

TODAY'S SCHEDULE

01

Ensure you are set-up with Python & VSC

→ Get into python in 5 minutes

02

Case-study

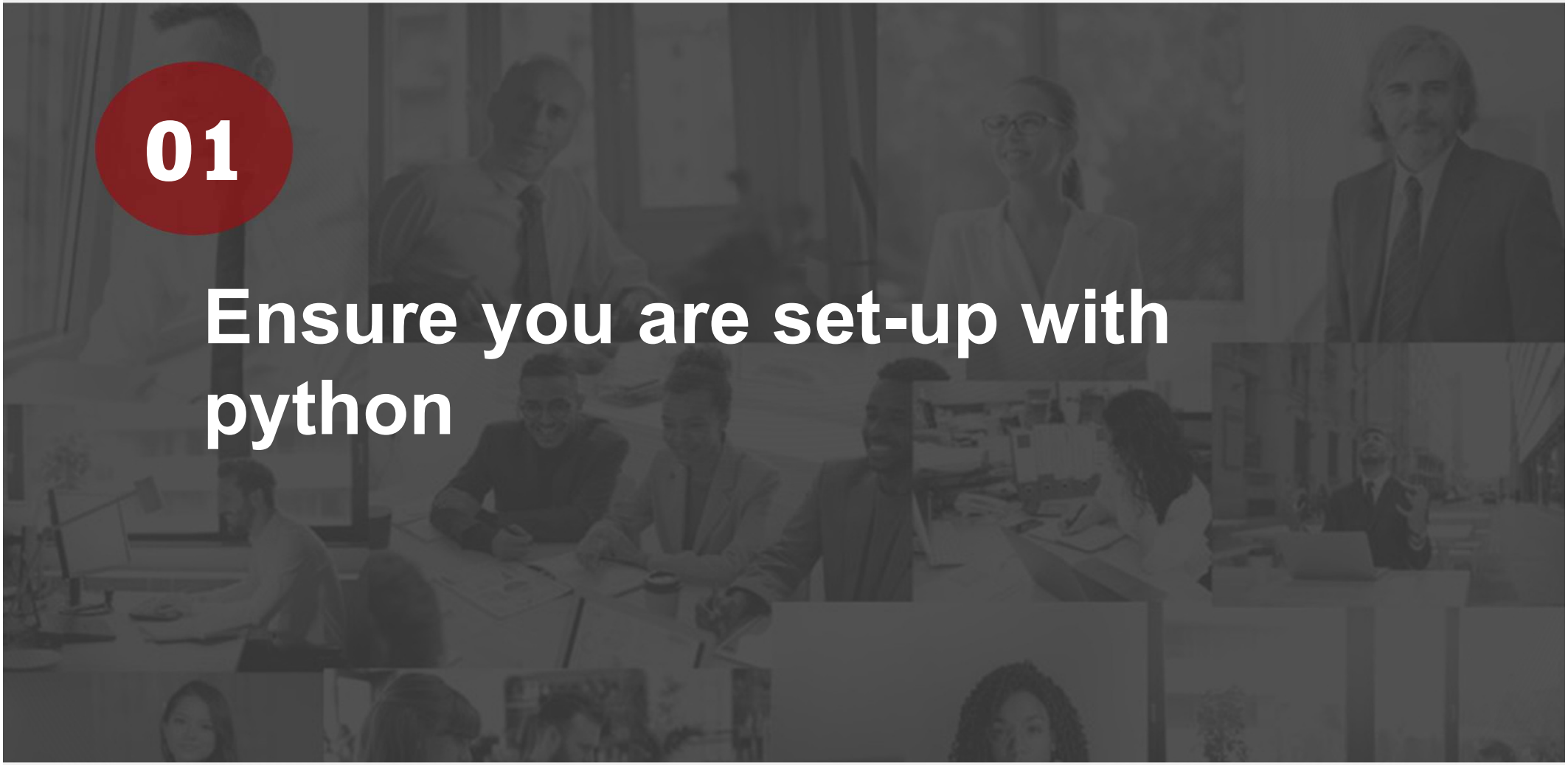
→ Purchase order price higher than average

03

Python structures

Visualizing python structures

09:05 – 09:10



09:05 – 09:10

Pre-requisites

1. You have python installed on your machine
2. You have Visual Studio Code installed on your machine

We will now follow these instructions that you received by e-mail

03_INSTALL_YOU
_PYTHON_ENVIRO

You might need to open PowerShell as administrator and do:

Set-ExecutionPolicy -Scope CurrentUser -ExecutionPolicy RemoteSigned

01: Install python and VSC on your machine

02: Run a hello-world script

09:05 – 09:10

02

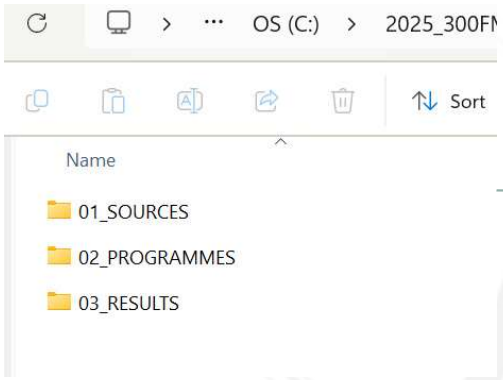
Basic functions
Case study: purchase orders with price > average price

Note: normally you would have to add currency conversion step

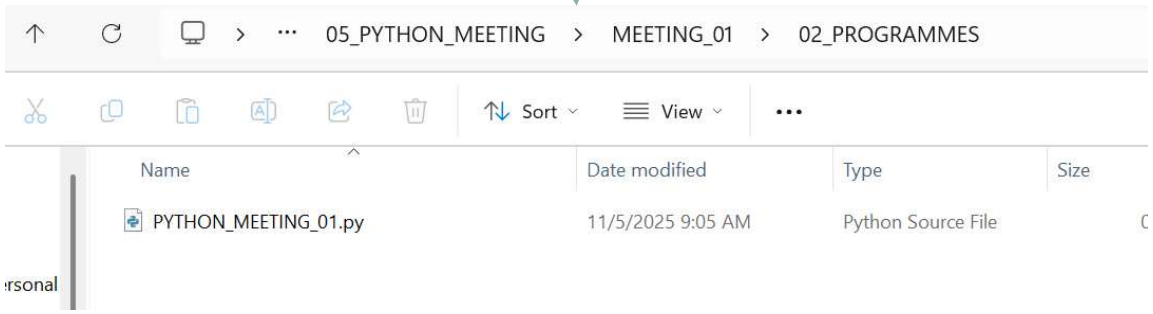
09:10 – 09:15

Basic functions – .venv and library import -> your own requirements.txt

Set-up your folders:

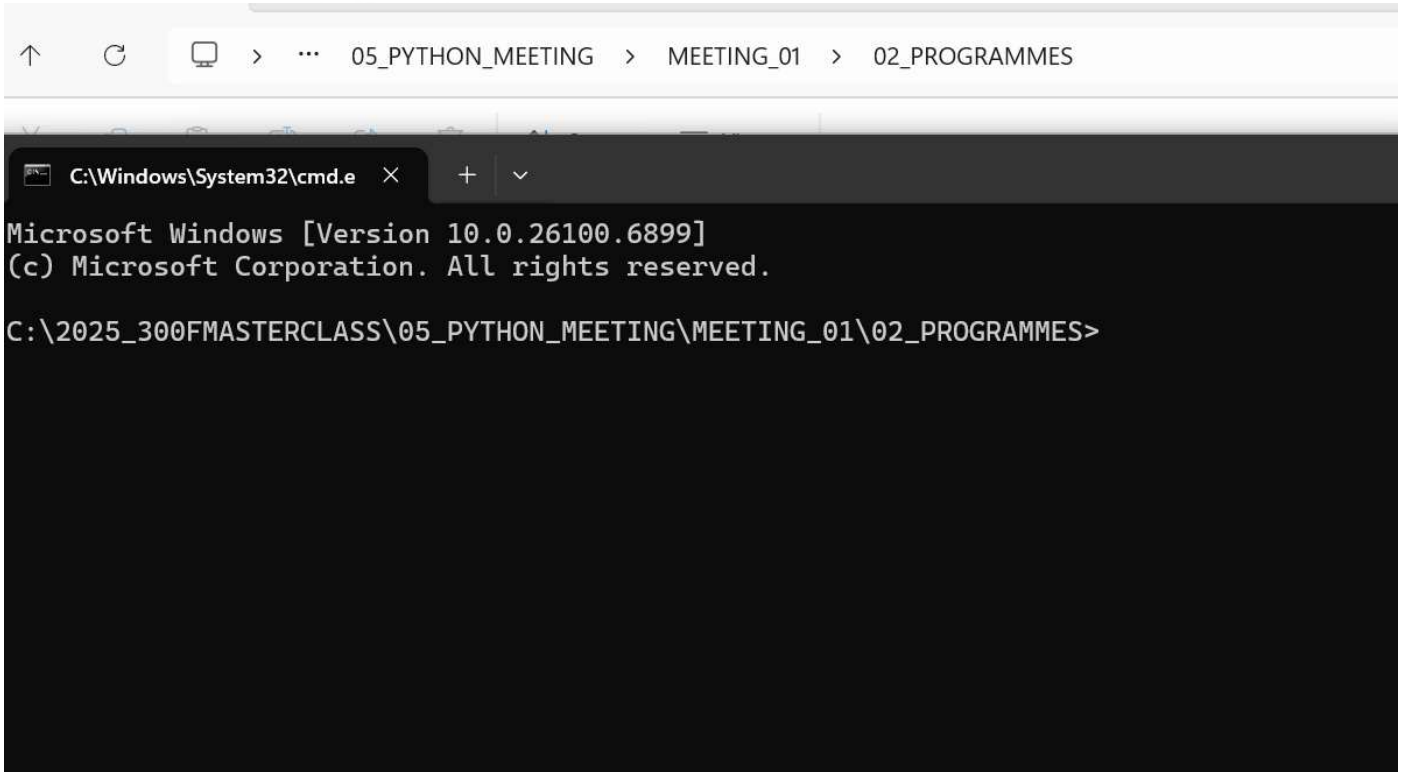


Put .py empty text file in Programmes folder



Basic functions – .venv and library import -> your own requirements.txt

Open visual studio code in the right place -> type CMD in Windows folder



Basic functions – .venv and library import -> your own requirements.txt

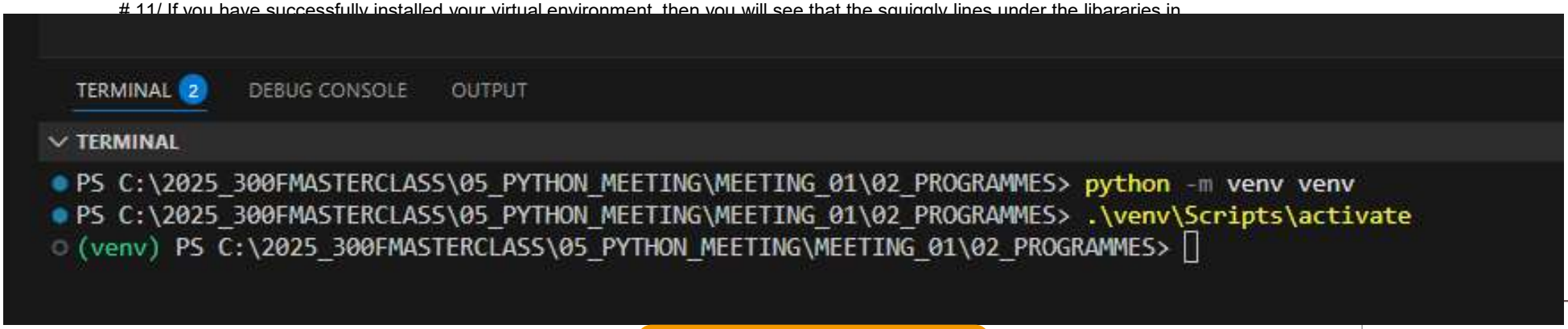
.venv environment

Copy this text at the top of the python script – as a reminder:

```
# Before running this script, create a virtual environemnt for your project, activate the virtual environment and then install the requirements to your virtual environment
# 1/ Go to the 02_PROGRAMMES folder and type CMD in the Windows search bar
# 2/ Then, in the black box that opens, type code . (code space dot)
# 3/ Visual studio code will then open in the correct location
# 3/ Open the terminal, in Visual Studio Code: (View-> Terminal or CTRL+SHIFT+`)
# 4/ In the terminal make sure that you are in the 02_PROGRAMMES folder (if you are not do cd .. to go back up a directory or cd <directoryName> to go to a directory)
# 5/ Then in the terminal type python -m venv venv
# 6/ Then select the new environment that you just made, as the interpreter, by right-clicking on environment in the bottom right hand corner of Visual Studio Code and entering the address to the folder where the python.exe is found on your machine
#    for example:
C:\2025_300FMASTERCLASS\02_PRESENTATION\01_LIVE_SESSION_01\PYTHON_EXAMPLE\02_PROGRAMMES\venv\Scripts
# 7/ With your new virtual environment selected as the interpreter, enter the following in the terminal: .\venv\Scripts\activate
# 8/ After you do that you should see that the folder address in the terminal then has (venv) in front of it in green.
# 9/ After that, you can activate the requirements file, and the lirbaries that are required for this python script will go inside
#    that virtual environment. Do import the requirements into your envrionment, you can run this in the terminal: pip install -r requirements.txt
# 10/ Then wait for about 5 minutes while it installs those librarires into the venv of this project.
# 11/ If you have successfully installed your virtual environment, then you will see that the squiggly lines under the libararies in
```

Tips: View-> word wrap

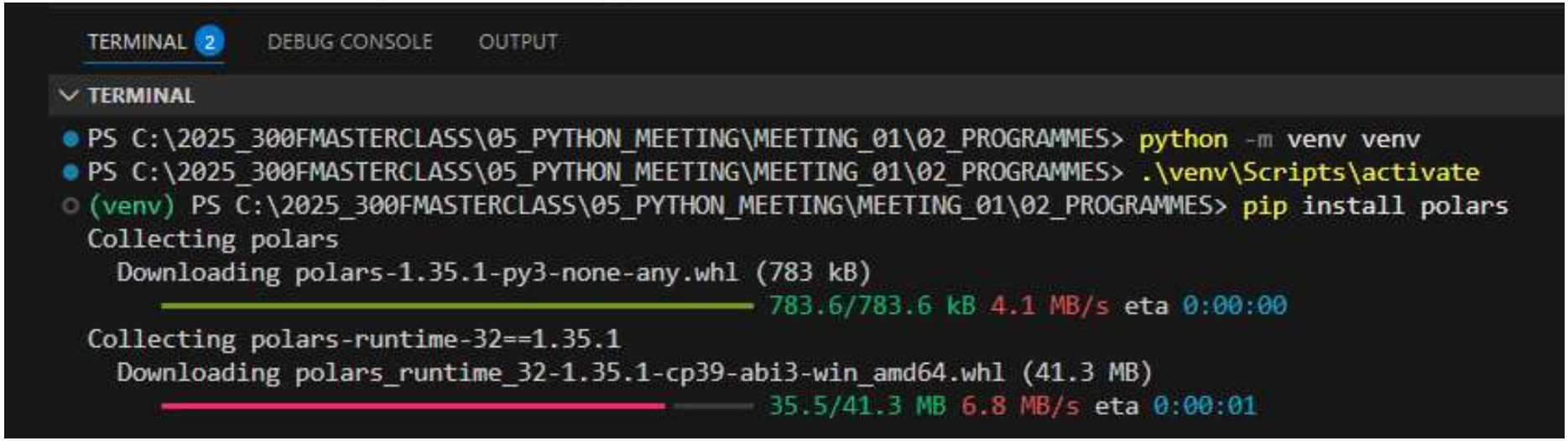
Tips: Answer Yes if it asks you to use that environment



Basic functions – install a library

pip install polars

Tip – if for some reason you don't have pip – type python -m ensurepip --upgrade



Basic functions – install a library

Get the version of polars that you just installed: pip show polars

```
(venv) PS C:\2025_300FMASTERCLASS\05_PYTHON_MEETING\MEETING_01\02_PROGRAMMES> pip show polars
Name: polars
Version: 1.35.1
Summary: Blazingly fast DataFrame library
Home-page:
Author:
Author-email: Ritchie Vink <ritchie46@gmail.com>
License: Copyright (c) 2025 Ritchie Vink
Some portions Copyright (c) 2024 NVIDIA CORPORATION & AFFILIATES. All rights reserved.

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of this software and associated documentation files (the "Software"), to deal
in the Software without restriction, including without limitation the rights
to use, copy, modify, merge, publish, distribute, sublicense, and/or sell
```
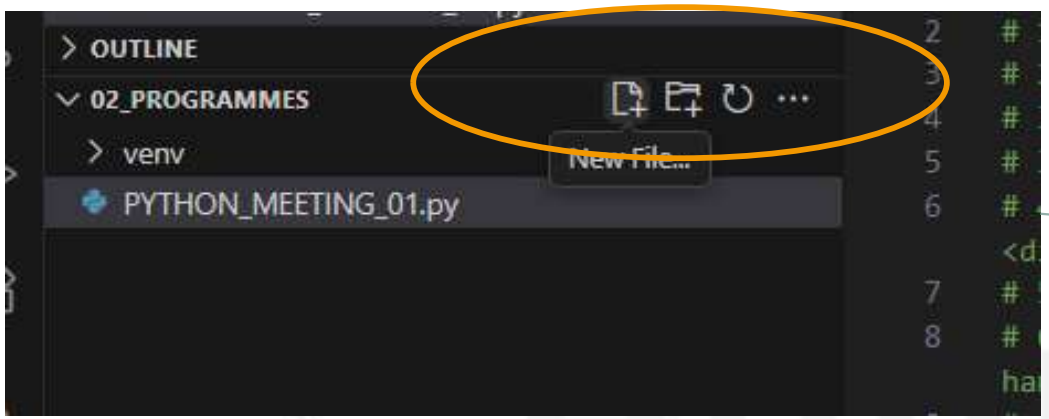
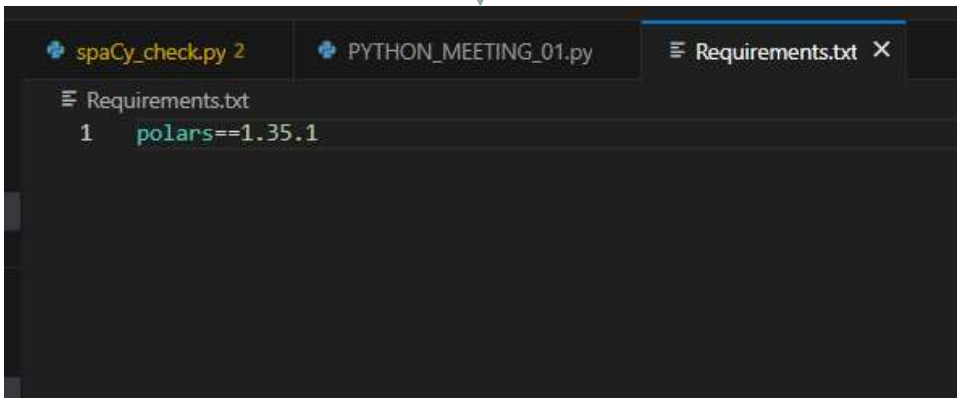

Tip – use this button to make terminal bigger and then you can reduce it again

Basic functions – install a library

Create requirements file

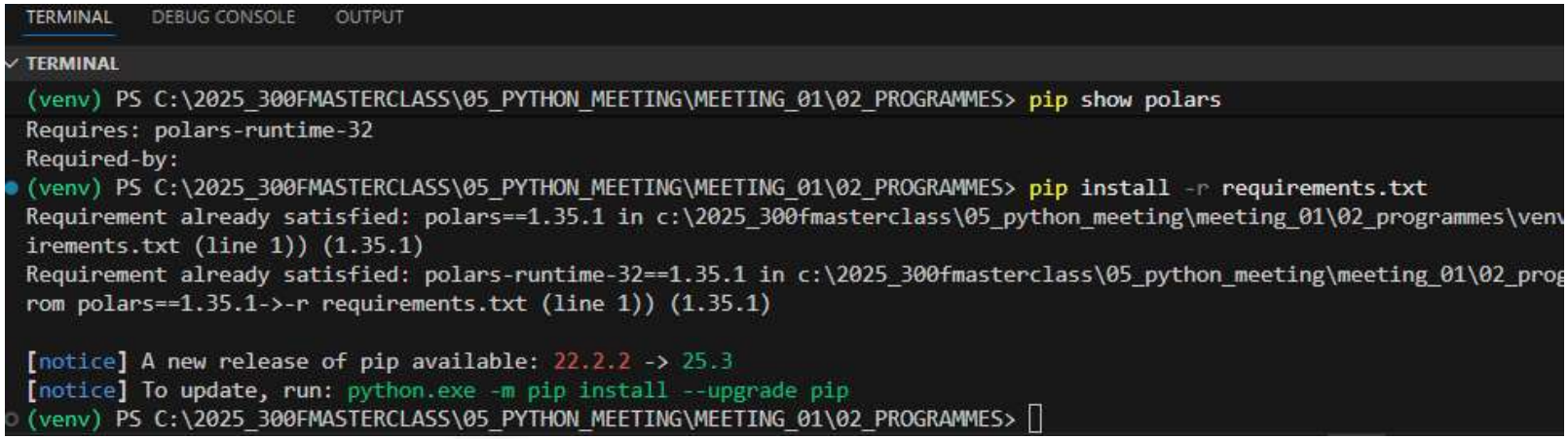


Tip – ensure autosave is on



Basic functions – install a library

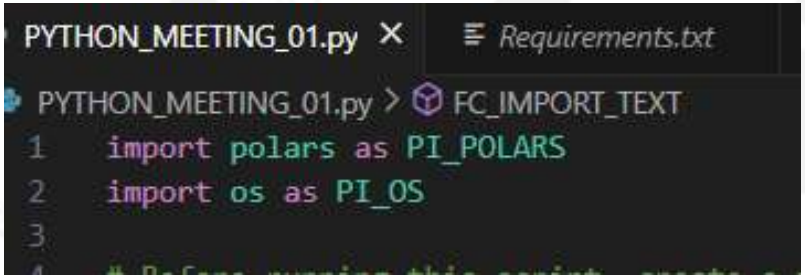
Test run requirements.txt pip install -r requirements.txt



Basic functions – import your library

Put at the top of your script:

import polars as PI_POLARS
import os as PI_OS



Basic functions – create a variable

Create variables

```
ZV_NU_THRESHOLD = 10000
ZV_ST_SOURCES_FOLDER ='C:/2025_300FMASTERCLASS/05_PYTHON_MEETING/MEETING_01/01_SOURCES/'
ZV_ST_SOURCE_FILE_EKKO='20240510_152615_1_EKKO.csv'
ZV_ST_SOURCE_FILE_EKPO='20251025_180621_1_EKPO.csv'
ZV_ST_SOURCE_FILE_APPROVLIM='A_APPROVAL_LIMITS.json'
ZV_ST_RESULTS_FOLDER='C:/2025_300FMASTERCLASS/05_PYTHON_MEETING/MEETING_01/03_RESULTS/'
```

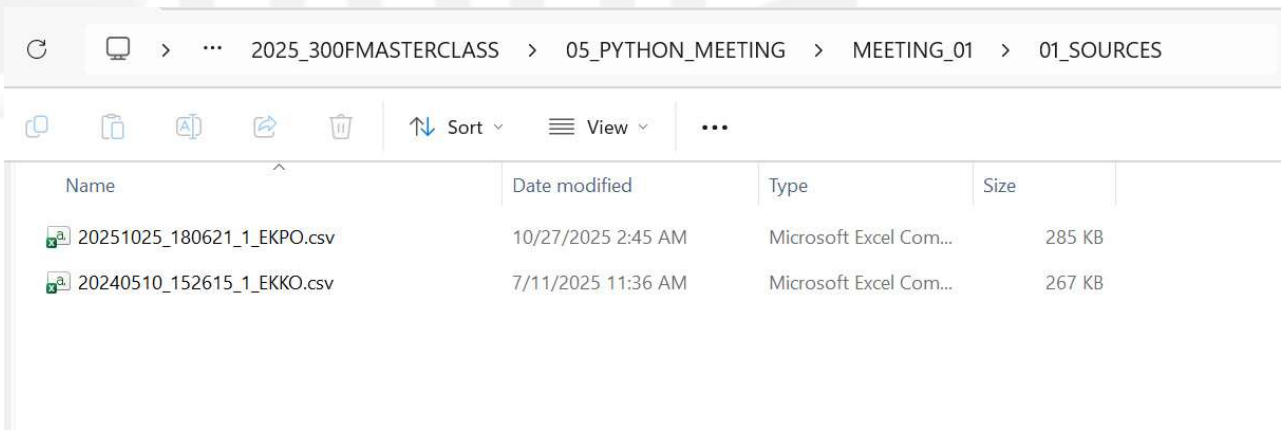
Tip – make sure no spaces in folder names and change \ to / and put / at the end

Basic functions – import and rename

Put these two files in your sources folder:

A_EKPO

A_EKKO



Basic functions – import and rename

Import function – copy to your python program

Note: in python – functions must go above where they are used – so usually we put them at the top or in a separate script

```
# 2.1/ Import
def FC_IMPORT_TEXT(
        ZVFCI_ST_SOURCE_FILE,
        ZVFCI_ST_FOLDER,
        ZVFCI_ST_DELIMITER
    ):
    ZV_ST_FILE_PATH = PI_OS.path.join(ZVFCI_ST_FOLDER, ZVFCI_ST_SOURCE_FILE)


    ZV_DF_HEADER = PI_POLARS.read_csv(
        ZV_ST_FILE_PATH,
        separator=ZVFCI_ST_DELIMITER,
        encoding='utf8',
        has_header=True,
        n_rows=1,
        infer_schema_length=0,
        quote_char=None
    )
    ZV_LI_COLS = ZV_DF_HEADER.columns


    ZV_DI_SCHEMA_OVERRIDES = {ZV_COL: PI_POLARS.Utf8 for ZV_COL in ZV_LI_COLS}


    ZV_DF = PI_POLARS.read_csv(
        ZV_ST_FILE_PATH,
        separator=ZVFCI_ST_DELIMITER,
        encoding='utf8',
        ignore_errors=True,
        has_header=True,
        schema_overrides=ZV_DI_SCHEMA_OVERRIDES,
        infer_schema_length=0,
        null_values=[""],
        quote_char=None


    ).fill_null('')


    return ZV_DF
```

Basic functions – import and rename

Call the import function

```
# Step 3/ Import the files
ZV_DF_EKKO = FC_IMPORT_TEXT(ZV_ST_SOURCE_FILE_EKKO,ZV_ST_SOURCES_FOLDER,'\t')
ZV_DF_EKPO = FC_IMPORT_TEXT(ZV_ST_SOURCE_FILE_EKPO,ZV_ST_SOURCES_FOLDER,'|')


print(ZV_DF_EKKO.head())
print(ZV_DF_EKPO.head())
```

Tip – ensure that things are working as expected use print(<DF_NAME>.head())

Basic functions – import and rename

Rename fields – copy to your python program

```
# Step 4/ EKKO
# 4.1/ Select / rename
ZV_DF_EKKO = (
    ZV_DF_EKKO
    .select(
        [
            'EBELN',
            'BEDAT',
            'ERNAM',
            'LIFNR'
        ]
    )
    .rename(
        {
            'EBELN':'EKKO_EBELN',
            'BEDAT':'EKKO_BEDAT',
            'ERNAM':'EKKO_ERNAM',
            'LIFNR':'EKKO_LIFNR',

        }
    )
)
```

```
# Step 5/ EKPO
# 5.1/ Select / rename
ZV_DF_EKPO= (
    ZV_DF_EKPO
    .select(
        [
            'EBELN',
            'EBELP',
            'NETPR',
            'NETWR',
            'MATNR',
            'BPUMZ',
            'BPUMN'
        ]
    )
    .with_columns(
        [
            PI_POLARS.col('NETPR')
            .cast(PI_POLARS.Float64)
            .alias('NETPR'),


            PI_POLARS.col('NETWR')
            .cast(PI_POLARS.Float64)
            .alias('NETWR'),


            PI_POLARS.col('BPUMZ')
            .cast(PI_POLARS.Float64)
            .alias('BPUMZ'),


            PI_POLARS.col('BPUMN')
            .cast(PI_POLARS.Float64)
            .alias('BPUMN')
        ]
    )
    .rename(
        {
            'EBELN':'EKPO_EBELN',
            'EBELP':'EKPO_EBELP',
            'NETPR':'EKPO_NETPR',
            'NETWR':'EKPO_NETWR',
            'MATNR':'EKPO_MATNR',
            'BPUMZ':'EKPO_BPUMZ',
            'BPUMN':'EKPO_BPUMN',
```

```
print(ZV_DF_EKKO.head())
print(ZV_DF_EKPO.head())
```

Basic functions – joining

Add PO header to PO detail:

```
# Step 6/ Join
ZV_DF_EKPO_EKKO = (
    ZV_DF_EKPO
    .join(
        ZV_DF_EKKO,
        left_on='EKPO_EBELN',
        right_on='EKKO_EBELN',
        how='inner',
        suffix='_2'
    )
)


print(ZV_DF_EKPO_EKKO.head())
```

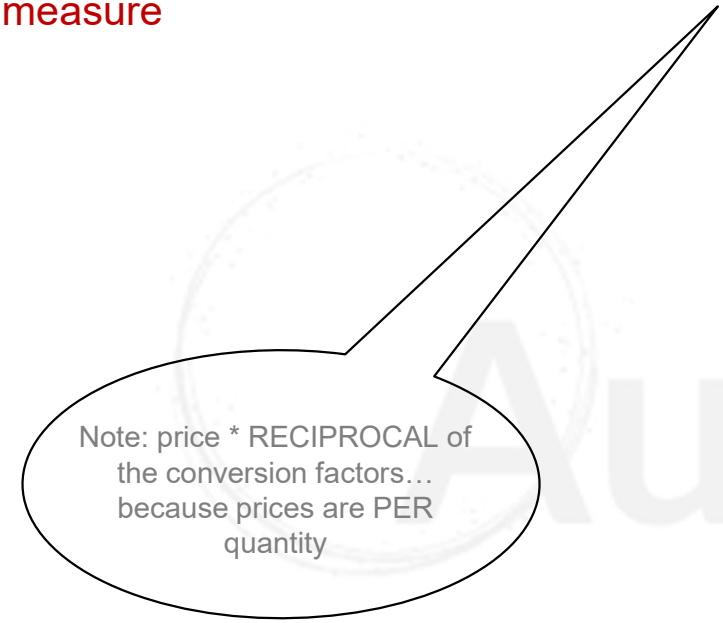
Inner join will eliminate any rows in EKPO that are not in EKKO

Tip: use ‘left’ when you don’t want to eliminate any rows

Tip: use ‘anti’ when you want those that don’t match

Basic functions – create columns

Compute the price into base units of measure




```
# Step 7/ Add columns
ZV_DF_EKPO_EKKO = (
    ZV_DF_EKPO_EKKO
    .with_columns(
        [
            PI_POLARS.when(
                PI_POLARS.col('EKPO_BPUMZ') == 0
            )
            .then(
                PI_POLARS.lit(1)
            )
            .otherwise(
                PI_POLARS.col('EKPO_BPUMZ')
            )
            .alias('ZF_EKPO_BPUMZ'),


            PI_POLARS.when(
                PI_POLARS.col('EKPO_BPUMN') == 0
            )
            .then(
                PI_POLARS.lit(1)
            )
            .otherwise(
                PI_POLARS.col('EKPO_BPUMN')
            )
            .alias('ZF_EKPO_BPUMN'),
        ]


    )
    .with_columns(
        (
            PI_POLARS.col('EKPO_NETPR') *
            (
                PI_POLARS.col('ZF_EKPO_BPUMN')/
                PI_POLARS.col('ZF_EKPO_BPUMZ')
            )
        )
        .alias('ZF_EKPO_NETPR_BPUMNBPUMZ')
    )
)
```

_EKPO_EKKO.head())

Basic functions – group

Group with aggregate – get the average price per material, filter

```
# Step 8/ Group_by
ZV_DF_TT_EKPO_EKKO_GROUP_BY = (
    ZV_DF_EKPO_EKKO
    .filter(
        (
            PI_POLARS.col('EKPO_MATNR') !=''
        ) &
        (
            PI_POLARS.col('ZF_EKPO_NETPR_BPUMNBPUMZ') !=0
        )
    )
    .group_by(
        'EKPO_MATNR'
    )
    .agg(
        [
            PI_POLARS.col('ZF_EKPO_NETPR_BPUMNBPUMZ')
            .mean()
            .alias('ZF_EKPO_NETPR_BPUMNBPUMZ_MEAN')
        ]
    )
)
```

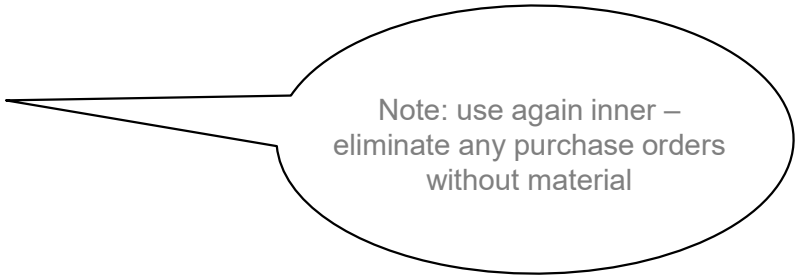
Note: naming convention – keeps our code easy to read!

Tip: ignore blank materials and blank suppliers (usually stock transports) to reduce false positives/ noise

Basic functions – join

Add back the average

```
# Step 9/ Join
ZV_DF_EKPO_EKKO = (
    ZV_DF_EKPO_EKKO
    .join(
        ZV_DF_TT_EKPO_EKKO_GROUP_BY,
        on='EKPO_MATNR',
        how='inner',
        suffix='_2'
    )
)


print(ZV_DF_EKPO_EKKO.head())
```



Basic functions – add columns

Calculate the % difference, filter

```
# Step 10/ Add fields/ filter
ZV_DF_EKPO_EKKO_HIGHNETPR = (
    ZV_DF_EKPO_EKKO
    .with_columns(
        (
            (
                (
                    PI_POLARS.col('EKPO_NETPR') -
                    PI_POLARS.col('ZF_EKPO_NETPR_BPUMNBPUM
Z_MEAN')
                ) /
                PI_POLARS.col('ZF_EKPO_NETPR_BPUMNBPUMZ_
MEAN')
            ) * 100
        )
        .alias('ZF_EKPO_NETPR_DIFF_PER')
    )
    .filter(
        (
            PI_POLARS.col('ZF_EKPO_NETPR_DIFF_PER') > 50
        ) &
        (
            PI_POLARS.col('EKPO_NETWR')>ZV_NU_THRESHOLD
        )
    )
)


print(ZV_DF_EKPO_EKKO.head())
```

Tip: use a lot of brackets and put operators always on preceding line: readability and less bugs!

Basic functions – export the result

Export the result – first do:

pip install pandas
pip install openpyxl
pip install pyarrow

Don’t forget to add to your requirements

pip show ….

Then copy-paste version to your requirements.txt

Basic functions – export the result

```
# 11/ Export the result


ZV_ST_RESULTS_FILE =
'ZV_DF_EKPO_EKKO_HIGHNETPR.xlsx'
FC_EXPORT_EXCEL(ZV_DF_EKPO_EKKO_HIGHNETPR,
ZV_ST_RESULTS_FOLDER, ZV_ST_RESULTS_FILE)
```

```
# 2.2/ Export
def FC_EXPORT_EXCEL(ZVFCI_DF_INPUT, ZVFCI_ST_RESULTS_FOLDER,
ZVFCI_ST_RESULTS_FILE):


    PI_OS.makedirs(ZVFCI_ST_RESULTS_FOLDER, exist_ok=True)


    ZV_ST_FILE_PATH = PI_OS.path.join(ZVFCI_ST_RESULTS_FOLDER,
ZVFCI_ST_RESULTS_FILE)


    ZV_DF_PANDAS = ZVFCI_DF_INPUT.to_pandas()

    ZV_DF_PANDAS.to_excel(
        ZV_ST_FILE_PATH,
        index=False,
        engine='openpyxl'
    )


    print(f"✅ Excel file successfully exported to:\n{ZV_ST_FILE_PATH}")
```


03
Python structures

Python structures

A list:

[1, ‘2’,[‘a’,’b’,’c’], 1]

A list is a list of objects: can be different types

A set:

{1, ‘2’,[‘a’,’b’,’c’]}

A set is a list – but no duplicates allowed

An array:

[1, 2,3,4,5]

An array is like a list, but all objects of the same type

A tuple

(1, ‘2’,[‘a’,’b’,’c’], 1)

A tuple is like a list but it cannot be changed or indexed

A dictionary:

{
‘Suppliers’: (‘a’,’b’,’c’)
‘Number’: (1,2,3)
‘Value’:(100,150,300)
}

A dictionary has names that reference objects.

A dataframe:

A dataframe (~table) is like a dictionary, where the names are column names and the objects are arrays (have same type within them).

A series:

If we take a column out it is called a series

09:45 – 09:50

Python structures

(GBP, EUR)
(GBP, USD)
(GBP, ZAF)

Group keys

group_by object

TCURR_GDATU	TCURR_UKURS
20250101	0.61
...	...

TCURR_GDATU	TCURR_UKURS
20250101	0.93
...	...

TCURR_GDATU	TCURR_UKURS
20250101	20.01
20250102	20.03
20250103	20.02
...	...

Dataframes

Python structures

```
group_by([
        Company,
        Material,
        Month
])
```

3 Sub dataframes

Material	Month	Posting date	Input date	Input time	Document	Item	Quantity	Value
Bolts	Jan 2025	1 Jan 2025	1 Jan 2025	00:01:30	00001234	0001	10	200
Bolts	Jan 2025	2 Jan 2025	2 Jan 2025	00:05:20	00001235	0001	3	60
Bolts	Jan 2025	3 Jan 2025	3 Jan 2025	00:16:10	00001236	0001	2	400
Bolts	Jan 2025	25 Jan 2025	25 Jan 2025	00:01:30	00001237	0001	14	280
Bolts	Feb 2025	1 Feb 2025	1 Jan 2025	00:01:30	00001238	0001	5	1000
Bolts	Feb 2025	2 Feb 2025	1 Jan 2025	00:05:20	00001241	0001	6	1200
Bolts	Feb 2025	3 Feb 2025	1 Jan 2025	00:16:10	00001242	0001	17	3400
Bolts	Feb 2025	25 Feb 2025	1 Jan 2025	00:01:30	00001256	0001	2	400
Bolts	Mar 2025	1 Mar 2025	1 Mar 2025	00:01:30	00001281	0001	21	4200
Bolts	Mar 2025	28 Mar 2025	28 Mar 2025	00:05:20	00001290	0001	32	6400

09:50 – 09:55


Questions?