PROFIT

Python-Based Return On Investment and Financial Investigation Tool

1 License

2 Usage:

a) Run ***profit_main.py*** with a Python 3 interpreter. Check the console output. Some PDFs, with data based on the provided examples, are created in the plots-folder.

b) Modify the provided examples according to your situation. These files must adhere to certain standards, which are outlined in sec. 4 and 5 below.

c) Modify the settings in ***config.py*** according to your needs.

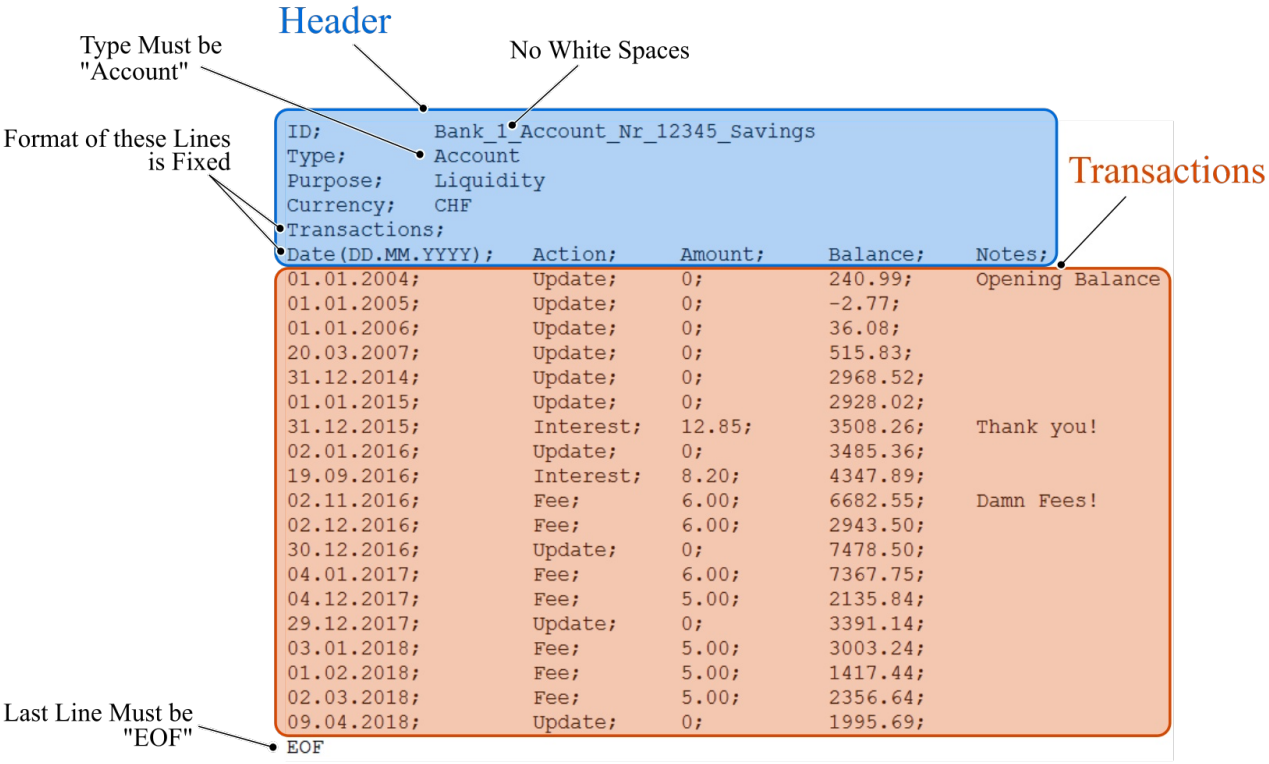
3 Key Principles

PROFIT adheres to certain conventions and concepts as follows.

- Assets are divided into accounts and investments:
  - **Accounts** simply hold money. Their returns are not tracked, as the maintenance of the inflows/outflows would be cumbersome (Accounts are often used daily, e.g., for paying bills). Account fees and interest can be recorded and visualized.
  - **Investments** are linked to prices that define their values. They are often traded (e.g., stocks). Every in- and outflow of an investment (e.g., buy/sell) is tracked. Cost and payouts are also recorded for a comprehensive data set.
- Values are given for specific dates. A calendar-**day** hence comprises the granularity of the data.
- Data is always analyzed from *today* (when the script is executed) a number of days (user-configurable) into the past. This is the *analysis range.*
  If online data of certain investments are not obtainable automatically, they must be provided as an “update”-transaction that defines the investment’s price of today (see ch. 5 below), or the price of the investment must be given as a file in the marketdata_storage folder (see ch. 6 below). A warning will be issued if the necessary data is missing, and the holding period return cannot be calculated.
- All values are converted to the base currency (defined in *config.py*), and then analyzed.
- Code should be long-term maintainable; As few python packages as possible are used, and most data manipulations are performed with native (built-in) python commands and data types.

4 Account Files

This is an example of an account file (store as .txt in the accounts folder):



Note the separator (semicolon) between the different columns. This is required for parsing the file. Any white space is stripped when the file is parsed, hence the account ID cannot contain white spaces, for example.

The **header** must be structured as illustrated and as follows:

- ***ID***
  User-definable string that identifies the account, e.g., name of the bank or the account number etc.
- ***Type***
  Must be "*Account*"
- ***Purpose***
  User-configurable, for grouping different assets. This string must be in the list of possible asset-purposes in the *PROFIT_main.py* file (ASSET_PURPOSES)
- ***Currency***
  Encodes the currency. This symbol is also used to automatically obtain exchange rates. Adhere to the ISO 4217 standard of currency designations: https://en.wikipedia.org/wiki/ISO_4217
- ***Transactions***
  This is a placeholder that signals the end of the user-configurable header.
  The following line is the header of the transactions, and its format is also fixed.

The **header-line of the transactions-section** contains the following columns:

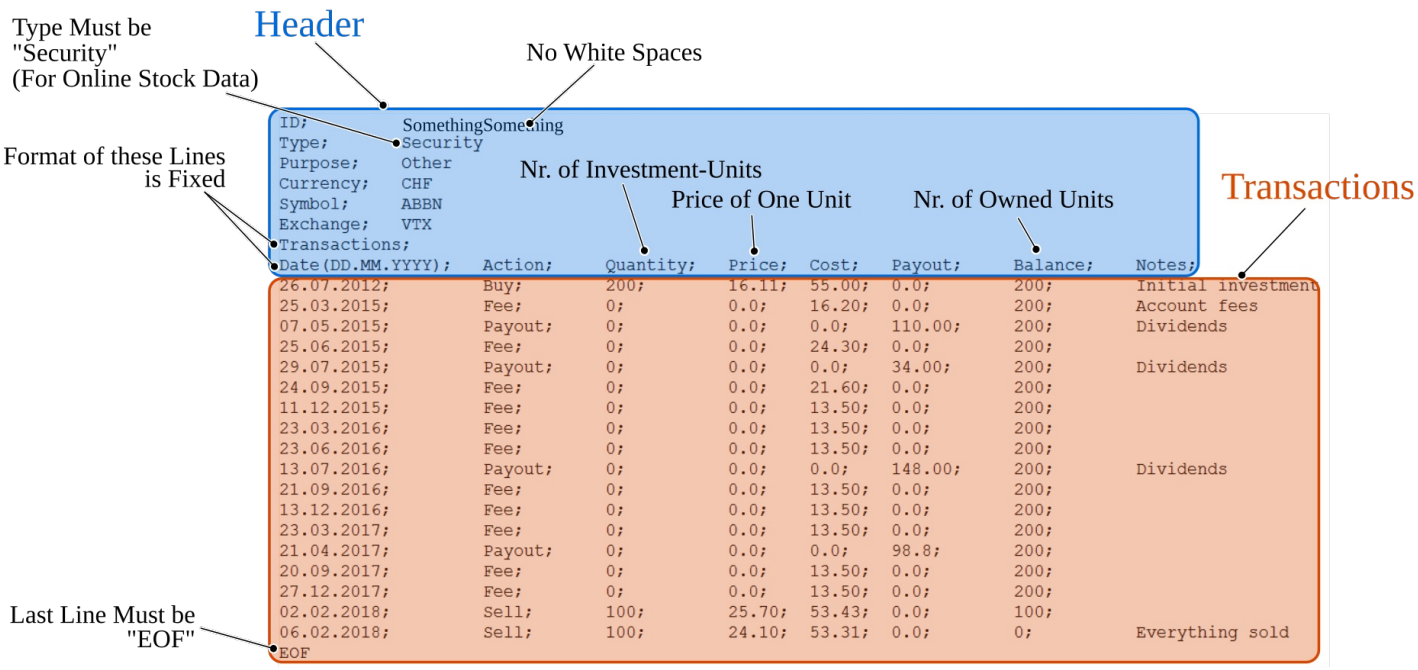
- ***Date (DD.MM.YYYY)***
  Date of a recorded transaction.
- ***Action***
  Encodes the type of transaction. Allowed are the following strings:
  - *Update*: Provides a new account-balance. *Amount* must be zero.
  - *Interest*: Payout (e.g., interests). The amount must be given in the "*amount*" column. A new balance can also be provided with the same transaction.
  - *Fee:* Similar than interest, but considers cost associated with the account.
- ***Amount***
  The amount of payouts or cost, in the account's currency

- ***Balance***
  The balance of the account after the transaction, in the account's currency
- ***Notes***
  User-definable string for personal notes.

The last line of the transactions must be the string "EOF" (end of file).

5 Investment Files

This is an example of an investment file (store as .txt in the investments folder):



Note the separator (semicolon) between the different columns. This is required for parsing the file. Any white space is stripped when the file is parsed, hence the ID cannot contain white spaces, for example.

The **header** must be structured as illustrated and as follows:

- ***ID***
  User-definable string that identifies the investment, e.g., name of the bank, ISIN number etc.
- ***Type***
  For automatic market price retrieval, the type must be "*Security*". Any other string can be used, but it will not be attempted to obtain market prices online.
- ***Purpose***
  User-configurable, for grouping different assets. This string must be in the list of possible asset-purposes in the *PROFIT_main.py* file (*ASSET_PURPOSES*)
- ***Currency***
  Encodes the currency. This symbol is also used to automatically obtain exchange rates. Adhere to the ISO 4217 standard of currency designations: https://en.wikipedia.org/wiki/ISO_4217
- ***Symbol***
  Ticker symbol of listed assets, e.g., "AAPL", "TSLA" etc. This string is used by the online data retrieval tools to identify the asset.
  Go to yahoo finance and use the ticker as displayed, e.g., ABBN is ABBN.SW. This works best for the alpha vantage API.
- ***Exchange***
  Name of the stock exchange, where the investment is traded, e.g., "SWX", "NASDAQ" etc. This string is used by the online data retrieval tools to identify the exchange.
- ***Transactions***
  This is a placeholder that signals the end of the user-configurable header.
  The following line is the header of the transactions, and its format is also fixed.

The **header-line of the transactions-section** contains the following columns:

- ***Date (DD.MM.YYYY)***
  Date of a recorded transaction.

- ***Action***
  Encodes the type of transaction. Allowed are the following strings:
  - *Buy*: A certain quantity of the investment (given by the *Quantity*-column) is bought (e.g., a number of stocks). This transaction requires a *quantity* and a *price* (which corresponds to the market price of a single investment-unit). A *cost* can also be given (but no *payout*). The *balance* must correspond to the old balance plus the newly bought units. The first transaction of an investment must be a *buy* action.
  - *Payout*: Used to track payouts, e.g., dividends. The amount must be given in the *payout* column. *Price* and *cost* may not be given and *quantity* must also be zero, and the *balance* must be correct. Value given in the investment's currency.
  - *Cost*: Similar than *payout*, it considers cost associated with the investment. The value is given in the *cost* column. *Price, payout* and *quantity* must be zero, and the *balance* must be correct. Value given in the investment's currency.
  - *Sell*: Like *buy*, but the *balance* of the investment is reduced. The value in the *balance* column must correspond to the new balance.
  - *Update* (not illustrated in the example above): Used to provide a new *price*, in case online data retrieval is not possible. Simply state the *price* (of one unit of the investment) in the *price* column. *Cost, payout* and *quantity* must be zero, but *balance* must be correct.
  - *Split* (not illustrated in the example above): Needed when the stock undergoes a split. Simply provide the new price and balance. The split ratio will be calculated from the newly provided balance. Cost and payout must be empty.
    Note: The split ratio can also be given in the Quantity column, if the balance is 0. Usually, the ratio is determined/derived from the balance, but if the balance is 0, the ratio can/has to be given in the "quantity" column! Reverse splits (ratio <1) are also possible.
- ***Quantity***
  Bought or sold investment quantities. Can be a floating-point number.
- ***Price***
  The *price* (in the investment's currency) of a single investment-unit of a *buy* or *sell* transaction. Can also be updated with an *Update*-action (see above).
- ***Cost*** and ***Payout***
  Associated *costs* or yields with the corresponding transactions. The net yield is given by payout – cost, so state the payout value before cost is deducted.
- ***Balance***
  Held investment quantities (e.g., nr. of stocks). Must be correctly updated when *buy* or *sell* transactions are performed.
- ***Notes***
  User-definable string for personal notes.

The last line of the transactions must be the string "EOF" (end of file).

6 Marketdata-Storage Files

The folder *marketdata_storage* contains an automatically updated and maintained database of prices of assets, comprising a collection of text files. The files contain a header and a data section with two columns; the date and the price of the asset.

If a file is missing, it gets automatically created. The file name must/will adhere to a certain format.

It is possible to manually add and maintain files, if the automatic retrieval of asset prices and exchange rates is not possible.

The storage entries generally have priority over online-obtained data, i.e., if online retrieved data and data from these files mismatch, the data from the marketdata-files will be used. However, this is configurable via the header-flag "*Overwrite_storage*" (see below). If set to True, then obtained prices will overwrite stored data. Note: If stored data is present, then online data might not be retrieved (and hence, no data will be overwritten). Delete old data, or create a missing date/hole in the data-list, to force PROFIT to pull all provider data (and potentially overwrite the stored data). Note that the amount of data obtained is also determined by the length of the analysis range (cf. *config.py*).

The idea of this database is to retain data over long periods of time, and to provide an easy to maintain set of offline data.

The files are configurable with a header. Some headers are configurable:

Stock/Securities:

```
Header;
Id;<Name>
Overwrite_storage;<True/False>
Split;<date>;<float>
Split;<date>;<float>
Data;
<date>;<value>
...
```

The split-lines are optional. Normal splits have a split-factor >1. Reverse splits are <1.
If a split is present in the storage-header, then the corresponding _provider_ data will be adjusted (and not the stored csv-data!).
CAREFUL: Once the split-data is given in the header, any data from the corresponding provider will always be modified and written to the file (where it then becomes ground-truth).

NOTE: If you introduce or modify a split in a storage-csv-file, you MUST delete all content fo the file (but keep the header!). This forces profit to re-pull all data from the provider, and apply the split going forward. Alternatively, it is also sufficient to delete a single data-line (to create a hole in the stored data; this also makes PROFIT pull all data). Note also that the analysis range affects how much data is pulled (and potentially overwritten into storage, cf. *Overwrite_storage*).

You also might have to play with the day of the split in the storge-header by +/- 1 day to match the recorded transactions.

Forex- or Index-Files:

```
Header;
Id;<Name>
Overwrite_storage;<True/False>
Data;
<date>;<value>
...
```

7 Project Structure

Name	Type	Function
profit_main.py	File	Main script. Run with a Python 3 interpreter to generate the output.
profit_src	Folder	Main python package with all PROFIT source code
accounts	Folder	Stores the files that encode accounts
investments	Folder	Stores the files that encode investments
marketdata_storage	Folder	Contains historic prices of investments and foreign exchange rates. The files are automatically updated with new data, if possible. Files can be added manually, if prices of some investments cannot be obtained automatically.
plots	Folder	The output of the main script is created in this folder
doc	Folder	Documentation

8 Revision History

PROFIT Version	Date	Comment
1.0	24.04.2018	Initial running version - Mario Mauerer
1.1	13.08.2018	Migrated from (terminated) Google finance API to Alpha Vantage as data provider
1.2	05.01.2021	Migrated from Alpha Vantage to Yahoo Finance, added/fixed stock splits.
1.3	Nov. 2023	Improved speed significantly. Fixed some bugs.
1.4	Nov. 2023	Improved handling of storage- and provider-data. Introduced splits in storage-data as well. Introduced better package-structure.
1.5	Dec. 2023	Bugfixes, performance improvements