

PROFIT

Python-Based Return On Investment and Financial Investigation Tool

1 License

MIT License

PROFIT - Python-Based Return on Investment and Financial Investigation Tool

Copyright (c) 2018 Mario Maurer

Permission is hereby granted, free of charge, to any person obtaining a copy 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 copies of the Software, and to permit persons to whom the Software is furnished to do so, subject to the following conditions:

The above copyright notice and this permission notice shall be included in all copies or substantial portions of the Software.

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

2 Usage:

- a) (Optional) Obtain an API key from *Alpha Vantage* (<https://www.alphavantage.co/>) to be able to access their data base. It is used to automatically download prices of assets (e.g., stock prices). Enter the key in the file *setup.py*.
Note that this API has a rate limit and hence, only ca. 2 requests per minute are performed by the tool such that the API does not start blocking.
- b) 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. Marvel at the results.
- c) Move the provided examples to the *accounts* and *investments* folders, and modify them according to your situation. These files must adhere to certain standards, which are outlined in sec. 4 and 5 below. Change the folders from the example-folders in *PROFIT_main.py*, such that your files are analyzed (ACCOUNT_FOLDER and INVESTMENT_FOLDER).
- d) Modify the configurable settings in *PROFIT_main.py* according to your demands.
- e) Enjoy the tool and contribute on *GitHub*: <https://github.com/MauererM/profit>

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 (with the correct file name) in the marketdata-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 *PROFIT_main.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):

The diagram shows an account file structure with two main sections: a blue-shaded **Header** and an orange-shaded **Transactions** section. Annotations include: 'Type Must be "Account"' pointing to the 'Type;' field; 'No White Spaces' pointing to the 'ID;' field; 'Format of these Lines is Fixed' pointing to the header fields; and 'Last Line Must be "EOF"' pointing to the final line of the transactions section.

Header					
ID;	Bank_1_Account_Nr_12345_Savings	Type;	Account	Purpose;	Liquidity
Currency;	CHF	Transactions;			
Date (DD.MM.YYYY);	Action;	Amount;	Balance;	Notes;	
01.01.2004;	Update;	0;	240.99;	Opening	Balance
01.01.2005;	Update;	0;	-2.77;		
01.01.2006;	Update;	0;	36.08;		
20.03.2007;	Update;	0;	515.83;		
31.12.2014;	Update;	0;	2968.52;		
01.01.2015;	Update;	0;	2928.02;		
31.12.2015;	Interest;	12.85;	3508.26;	Thank you!	
02.01.2016;	Update;	0;	3485.36;		
19.09.2016;	Interest;	8.20;	4347.89;		
02.11.2016;	Fee;	6.00;	6682.55;	Damn Fees!	
02.12.2016;	Fee;	6.00;	2943.50;		
30.12.2016;	Update;	0;	7478.50;		
04.01.2017;	Fee;	6.00;	7367.75;		
04.12.2017;	Fee;	5.00;	2135.84;		
29.12.2017;	Update;	0;	3391.14;		
03.01.2018;	Fee;	5.00;	3003.24;		
01.02.2018;	Fee;	5.00;	1417.44;		
02.03.2018;	Fee;	5.00;	2356.64;		
09.04.2018;	Update;	0;	1995.69;		
EOF					

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 (encoded in *setup.py*):
 - *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):

Type Must be "Security" (For Online Stock Data)

Header

No White Spaces

Format of these Lines is Fixed

Transactions

Last Line Must be "EOF"

ID;	Type;	Purpose;	Currency;	Symbol;	Exchange;	Transactions;	Date (DD.MM.YYYY);	Action;	Quantity;	Price;	Cost;	Payout;	Balance;	Notes;
SomethingSomething	Security	Other	CHF	ABBN	VTX		26.07.2012;	Buy;	200;	16.11;	55.00;	0.0;	200;	Initial investment
							25.03.2015;	Fee;	0;	0.0;	16.20;	0.0;	200;	Account fees
							07.05.2015;	Payout;	0;	0.0;	0.0;	110.00;	200;	Dividends
							25.06.2015;	Fee;	0;	0.0;	24.30;	0.0;	200;	
							29.07.2015;	Payout;	0;	0.0;	0.0;	34.00;	200;	Dividends
							24.09.2015;	Fee;	0;	0.0;	21.60;	0.0;	200;	
							11.12.2015;	Fee;	0;	0.0;	13.50;	0.0;	200;	
							23.03.2016;	Fee;	0;	0.0;	13.50;	0.0;	200;	
							23.06.2016;	Fee;	0;	0.0;	13.50;	0.0;	200;	
							13.07.2016;	Payout;	0;	0.0;	0.0;	148.00;	200;	Dividends
							21.09.2016;	Fee;	0;	0.0;	13.50;	0.0;	200;	
							13.12.2016;	Fee;	0;	0.0;	13.50;	0.0;	200;	
							23.03.2017;	Fee;	0;	0.0;	13.50;	0.0;	200;	
							21.04.2017;	Payout;	0;	0.0;	0.0;	98.8;	200;	
							20.09.2017;	Fee;	0;	0.0;	13.50;	0.0;	200;	
							27.12.2017;	Fee;	0;	0.0;	13.50;	0.0;	200;	
							02.02.2018;	Sell;	100;	25.70;	53.43;	0.0;	100;	
							06.02.2018;	Sell;	100;	24.10;	53.31;	0.0;	0;	Everything sold
							EOF							

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 (encoded in setup.py):

- *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.

- **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 $\text{payout} - \text{cost}$, 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-Files

The folder *marketdata* contains an automatically updated and maintained database of prices of assets, comprising a collection of text files. The files contain two columns; the date and the price of the asset (for one asset-unit).

The specific assets are identified through the file name as follows:

- Traded securities:
price_<SYMBOL>_<EXCHANGE>_<CURRENCY>.txt
- Foreign exchange rates:
forex_<CURRENCY>_<BASECURRENCY>.txt

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

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.

7 Project Structure

Name	Type	Function
<i>PROFIT_main.py</i>	File	Main script. Run with a Python interpreter to generate the output.
accounts	Folder	Stores the files that encode accounts
investments	Folder	Stores the files that encode investments
marketdata	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 Used Software

The project requires/is tested and running with the following key python packages:

Package / Python	Package Version	PROFIT Version	Purpose
Python	3.5.2	1.1	Python
alpha_vantage	2.0.0	1.1	Market data and exchange rates
DateTime	4.2	1.1	Date manipulations
pandas	0.21.0	1.1	Process data from googlefinance.client
matplotlib	2.0.0	1.1	Plotting

9 Revision History

PROFIT Version	Date	Comment
1.0	24.04.2018	Initial running version - Mario Maurer
1.1	13.08.2018	Migrated from (terminated) Google finance API to Alpha Vantage as data provider