Financial Market Analytics Project

Ruben Agazzi 844736
Davide Abete 882299

July 13, 2022

Abstract

The project consist in the creation of portfolios, utilizing FTSE MIB index stocks, using different criteria in order to select the assets of the portfolios with a final analisys of the returns and risks of the portfolios

Contents

1 Introduction **2**

2 Dataset **2**
2.1 Dataset Columns 2
2.2 Data Exploration 2

3 Parameters **2**
3.1 Rolling Regression 2
3.2 Other parameters 3

4 Portfolio Selection **3**

5 Portfolios Data **3**
5.1 Portfolio returns 3
5.2 Beta Portfolio 3
5.3 R-Squared Portfolio 3
5.4 Stock variance Portfolio . . . 3
5.5 Residual variance Portfolio . . 3
5.6 Weekly returns Portfolio . . . 4
5.7 FTSE-MIB Portfolio 4

6 Results **4**

7 Conclusions **4**

Contents

1 Introduction

In this project, the goal consists in creating different porfolios, using FTSE MIB index stocks, using different criteria in order to select the assests of the portfolios. Finally we make some analisys on the created portfolios, such as the returns and the level of risk of the portfolios, in order to see which one is the better performing.

2 Dataset

The dataset used consists in past data about the FTSE MIB index, in particular is composed of daily data about the past 5 years of every singular stock present in the FTSE MIB index, obtained using the yahoo finance API.

2.1 Dataset Columns

The dataset is composed by the following columns:

- Date: Date relative to the datas of the singular stock.
- Open: Opening price of the stock.
- High: Highest price reached by the stock in the current day.
- Low: Lowest price reached by the stock in the current day.
- Close: Closing price of the stock.
- Volume: Trading volume of the stocks.
- Adjusted Close: Closing price adjusted after accounting for any corporate actions.
- log ret: This column is calculated using the adjusted close prices, is the logarithm of the adjusted close price of the current day of the stock subtracted by the logarithm of the adjusted close price of the previous day.

2.2 Data Exploration

The data did not present missing data so all the data is used inside the project.

3 Parameters

Afetr obtaining the data, we proceeded to obtain some parameters relative to the single stocks, in order to create the portfolios.

3.1 Rolling Regression

In order to obtain some of the parameters needed we proceeded to do a step of rolling regression on every single stock. The rolling regression was made using data about the past 180 days, and repeated for every week. The rolling regression is made using the Security Market Line(SML):

$$r_i = \alpha_i + \beta_i(R_M) + e_i$$

From the various rolling regressions we obtain the following parameters:

- Beta: is the beta coefficient obtained directly from the regression, this parameter indicates the Systematic Risk, in other words the risk that cannot be diversified away.
- Residual Variance(σ_{ei}): Is the variance of the residuals of the regression.
- R-Squared: R-Squared statistic obtained from the rolling regression, indicates how well the regression can fit the data.

We decided to not use also the α coefficient because in most of the regressions it wasn't statistically significative.

3.2 Other parameters

The other parameters used to build the portfolios are:

- Log returns: weekly logarithmic returns of the single stock.
- Risk: weekly risk of the single stock, obtained by calculating the variance of the weekly returns of the stock.

4 Portfolio Selection

In this phase we selected five different portfolios using different criteria. In general the portfolios are selected by ordering the weekly stock parameters in decrescent order, and selecting the top and bottom 10% of the ordered stocks. The parameters used for the portfolio creation are:

- Beta Coefficient
- Stock variance
- Stock returns
- Residual variance
- R-Squared

5 Portfolios Data

Using the mentioned parameters we obtained 5 different portfolios. For every portfolio we have obtained also the returns.

5.1 Portfolio returns

In order to obtain the portfolio returns we used the calculated weekly logarithmic returns, we made the inverse transformation in order to obtain the weekly return and multiplicated for the available investment.

$$r_t = r_{t-1} * e^{logret_t}$$

5.2 Beta Portfolio

This portfolio is obtained by taking the top and bottom 10% of the stocks, odered by the beta parameter, and is rebalanced every week.
The portfolio expected return,on the five years analized, is 102.067 euros, with an initial investment of 100 euros. The portfolio risk, calculated on the returns of a 100 euros investment, is equal to 11.26.

5.3 R-Squared Portfolio

This portfolio is obtained by taking the top and bottom 10% of the stocks, odered by the R-Squared parameter, and is rebalanced every week.
The portfolio expected return,on the five years analized, is 99.12 euros, with an initial investment of 100 euros. The portfolio risk, calculated on the returns of a 100 euros investment, is equal to 3.13.

5.4 Stock variance Portfolio

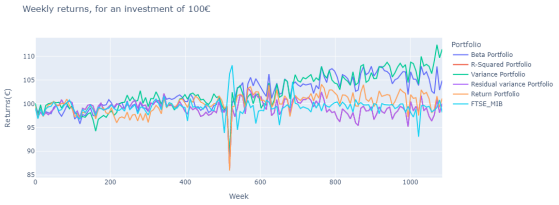
This portfolio is obtained by taking the top and bottom 10% of the stocks, odered by their stock return variance, and is rebalanced every week.
The portfolio expected return,on the five years analized, is 102.48 euros, with an initial investment of 100 euros. The portfolio risk, calculated on the returns of a 100 euros investment, is equal to 14.21.

5.5 Residual variance Portfolio

This portfolio is obtained by taking the top and bottom 10% of the stocks, odered by their

rolling regression residual variance, and is rebalanced every week.
The portfolio expected return,on the five years analized, is 99.12 euros, with an initial investment of 100 euros. The portfolio risk, calculated on the returns of a 100 euros investment, is equal to 3.13.

Figure 1: *Line chart of portfolios returns*



5.6 Weekly returns Portfolio

This portfolio is obtained by taking the top and bottom 10% of the stocks, odered by their weekly returns, and is rebalanced every week.
The portfolio expected return,on the five years analized, is 100.04 euros, with an initial investment of 100 euros. The portfolio risk, calculated on the returns of a 100 euros investment, is equal to 4.62.

5.7 FTSE-MIB Portfolio

This portfolio is obtained by following the FTSE-MIB index. The portfolio expected return,on the five years analized, is 99.27 euros, with an initial investment of 100 euros. The portfolio risk, calculated on the returns of a 100 euros investment, is equal to 2.52.

6 Results

Finally we made a table and a chart in order to compare all the portfolios.

Table 1: *Table containing the expected returns and risks of the created portfolios, calculated with an initial investment of 100 euros*

/	Expected Return	Risk
Beta	102.07	11.26
R-Squared	99.12	3.13
Variance	102.48	14.21
Residual Variance	99.12	3.13
Return	100.04	4.63
FTSE-MIB	99.26	2.52

7 Conclusions

As we can see from the obtained data relative to the portfolios, the riskier portfolios are the one that yield the higher returns. Some future work on this project could consist of adding more portfolios using more different parameters, and implementing a momentum strategy in order to obtain more returns from the portfolio.

Bibliography

[1] Sean J. Taylor Ben Letham. *Prophet: forecasting at scale*. URL: https://research.facebook.com/blog/2017/02/prophet-forecasting-at-scale/.

[2] Jason Brownlee. *How to Use XGBoost for Time Series Forecasting*. URL: https://machinelearningmastery.com/xgboost-for-time-series-forecasting/.

[3] Marco Fattore. *Fundamentals of time series analysis, for the working data scientist*. 2022.

[4] Winston Robson. *The Math of Prophet*. URL: https://medium.com/future-vision/the-math-of-prophet-46864fa9c55a.

[5] Grzegorz Skorupa. *Forecasting Time Series with Multiple Seasonalities using TBATS in Python*. URL: https://medium.com/intive-developers/forecasting-time-series-with-

multiple - seasonalities - using -
tbats-in-python-398a00ac0e8a.