Financial Market Analytics Project

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July 14, 2022

Abstract

The project consist in the creation of portfolios, utilizing FTSE MIB index stocks, the main benchmark index of Italian stock markets, using different criteria in order to select the assets of the portfolios, such as R-Squared, Beta Coefficient, Residuals variance, Stock variance and cross sectional momentum. Finally, last step concerns the analisys of the returns and risks of the portfolios.

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1 Introduction

In this project, the goal consists in creating different porfolios, utilizing 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
- Momentum Strategy
- Residual variance
- R-Squared

5 Portfolios Data

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

5.1 Returns

In order to calculate the weekly return of one portfolio for the week i analysis we took the logarithmic return at the starting day of the next week and we substract it by the log return at the start of the week.

$$WR_t = LogRet_{t+1} - LogRet_{t-7}$$

5.2 Risk

In order to calculate the weekly risk of the portfolio we calculate the variance-covariance matrix ant then by using the weights of the assets we get the variance of the portfolio. Finally we make the square root of the variance in order to obtain the standard deviation.

$$\sigma_P = \sqrt{\sum_{i=1}^{n}\sum_{j=1}^{n} w_i w_j \sigma_{i,j}}$$

5.3 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.

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

The portfolio annual return is obtained multiplicating by 52 the weekly portfolios logarithmic returns

5.4 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 annual returns are equal to 9.1%, while the annual risk associated to the portfolio is 36.23%. The efficiency of the portfolio is equal to 27.99%.

5.5 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 annual returns are equal to 15.2%, while the annual risk associated to the portfolio is 32.51%. The efficiency of the portfolio is equal to 42.1%.

5.6 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 annual returns are equal to 6.08%, while the annual risk associated to the portfolio is 35.25%. The efficiency of the portfolio is equal to 17.26%.

5.7 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 annual returns are equal to 15.2%, while the annual risk associated to the portfolio is 35.08%. The efficiency of the portfolio is equal to 43.48%.

5.8 Cross Sectional Momentum Portfolio

This portfolio is obtained by taking the top 20% of the stocks, odered by their weekly returns, and is rebalanced every week.
This aproach is a strategy called Cross Sectional Momentum Strategy, which consists in selecting the stocks of the portfolio by looking at past returns ant taking only the best performing stocks, in this case we used the previous week best performing stocks. The portfolio expected annual returns are equal to -114.18%, while the annual risk associated to the portfolio is 34.27%. The efficiency of the portfolio is equal to -414.04%.

5.9 FTSE-MIB Portfolio

This portfolio is obtained by following the FTSE-MIB index. The portfolio expected annual returns are equal to 0.26%, while the annual risk associated to the portfolio is 8.63%. The efficiency of the portfolio is equal to 3.07%.

6 Results

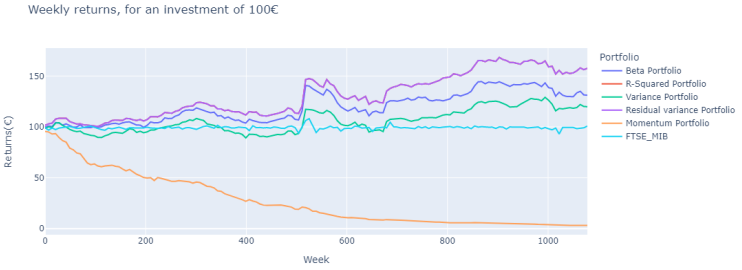
Finally we made a table and a chart in order to compare all the portfolios. We also calculated the efficiency of the portfolio:

$$Eff_P = \frac{Ret_{Ap}}{Risk_{Ap}}$$

Table 1: *Table containing the expected annual returns, risks and efficiency of the created portfolios.*

/	A. Ret(%)	A. Risk(%)	Eff.(%)
Beta	9.1	36.23	27.99
R-Squared	15.2	32.51	42.1
Variance	6.08	35.25	17.26
Res. Var.	15.2	35.08	43.48
Momentum	-114.18	34.27	-417.04
FTSE MIB	0.26	8.63	3.07

Figure 1: *Line chart of portfolios returns*



7 Conclusions

As wee can see by the results the best performing portfolios are the ones built with Residuals variance and R-Squared as paramenters. Also, the portfolio built with momentum strategy have the worst performace across all portfolio. The FTSE MIB portfolio, which is a proxy of the market, is the less risky portfolio but it also have smaller annual return compared to the other portfolios.

Bibliography

[1] Darren Hom. *How to Turn Cross-Sectional into Time-Series Momentum (and be home in time for dinner)*. URL: https://alphaarchitect.com/2020/01/how-to-turn-cross-sectional-into-time-series-momentum-and-be-home-in-time-for-dinner/.

[2] Borsa Italiana. *FTSEMIB*. URL: https://www.borsaitaliana.it/borsa/indici/indici-in-continua/dettaglio.html?indexCode=FTSEMIB.

[3] Will Kenton. *Beta*. URL: https://www.investopedia.com/terms/b/beta.asp.

[4] Will Kenton. *Security market line(SML)*. URL: https://www.investopedia.com/terms/s/sml.asp.