



POLITÉCNICA

UNIVERSIDAD
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Smallville investment strategy performance analysis

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Course: programming for data science

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1 Introduction

For this project we started by harvest the main assets daily prices from 01/01/2020 to 12/31/2020 from [investing.com](https://www.investing.com) then we generated 126 Portfolio allocation each represent the main assets and its associated weights for eg ST CB PB GO CA assets correspond to 80% 20% 0% 0% 0% respectively , finally and for the purpose to evaluate the *investment strategy performance* we performed a data analysis that will be explained in the next section.

2 investment strategy performance Analysis

Once the steps explained earlier finished and data quality is checked we proceeded by computing Two metrics the **portfolio return** and **Volatility** and based on those metrics prepare a data analysis. For the analysis part we used mainly pandas library.

The assets prices time series have some missing values (see Figure 1), The way we decided to handle them is by applying linear interpolation and backward extrapolation for missing values at the beginning of the time series (at 01/01/2020)

	Date	ST price	CB price	PB price	GO price	CA_price
0	2020-01-01	NaN	NaN	NaN	NaN	96.39
1	2020-01-02	194.59	77.58	253.28	143.95	96.85
2	2020-01-03	194.12	78.03	255.12	145.86	96.84
3	2020-01-06	193.81	77.50	254.16	147.39	96.67
4	2020-01-07	194.30	77.73	254.36	147.97	97.00
5	2020-01-08	195.26	77.73	254.82	146.86	97.30
6	2020-01-09	196.64	77.77	254.05	146.03	97.45
7	2020-01-10	196.26	78.19	254.35	146.91	97.36
8	2020-01-13	196.76	78.48	253.37	145.82	97.34
9	2020-01-14	197.01	78.42	253.83	145.69	97.37
10	2020-01-15	196.77	78.49	253.71	146.54	97.23
11	2020-01-16	198.10	78.21	253.87	146.31	97.32
12	2020-01-17	199.70	78.44	254.53	146.58	97.64
13	2020-01-20	199.76	78.57	254.49	NaN	97.61
14	2020-01-21	199.13	78.56	254.89	146.74	97.53
15	2020-01-22	199.63	78.11	255.12	146.79	97.53

Figure 1: Sample of missing data

2.1 Is more probable to obtain a positive or negative return?

To assess the **portfolios return** we plot the Return histogram in Figure 2 as can be seen the portfolios return distribution is skewed to the right which indicate that we

have more positive portfolio return. We also estimated the return 95% confidence interval which gave the range [4.53, 6.56] which means there is 95% confident that the return of all portfolio are between 4.53 and 6.56 since both are positive this confirm the observation made in the histogram: **it is more probable to have a positive Return**

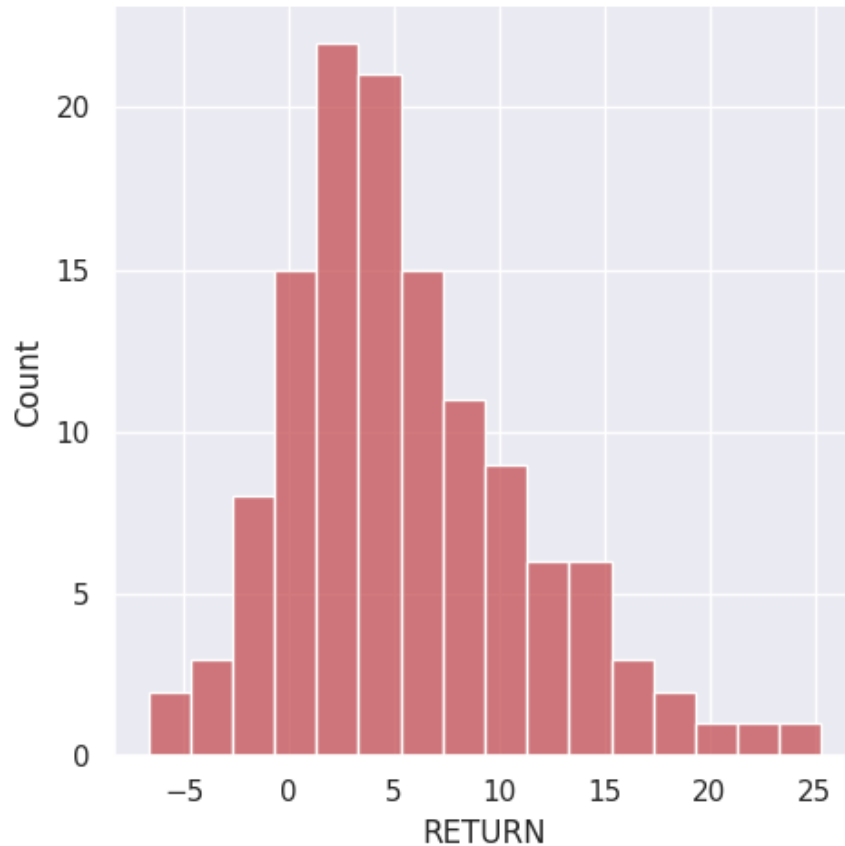


Figure 2: portfolios return histogram

2.2 It is always true that the higher the risk, the higher the obtained return is?

In this project the risk is defined as the volatility of the portfolio. Therefore we create the scatter plot in Figure 3.

From this scatter plot we can appreciate that the global trend represented in red shows that generally the portfolio return increases with the increase of volatility. Globally the correlation coefficient between portfolio return and volatility is **0.97** with a p_value of 1.33 e-76 given that the p_value is less than the significant level of 0.05, we have high confidence in the correlation coefficient estimated therefore and given that the correlation coefficient is positive we can confirm that globally there is a positive relationship between volatility and Return thus **higher risk can lead to a higher return** that been said there is some exception.

The trend represented in pink show that a small change in the volatility namely between 58 to 58.25 can lead to a high spread of portfolio return thus very low correlation between the return and the volatility.

Lastly the data point encapsulated in the blue square have a very low correlation between volatility and Return as for approximately the same volatility we have different portfolio Return values.

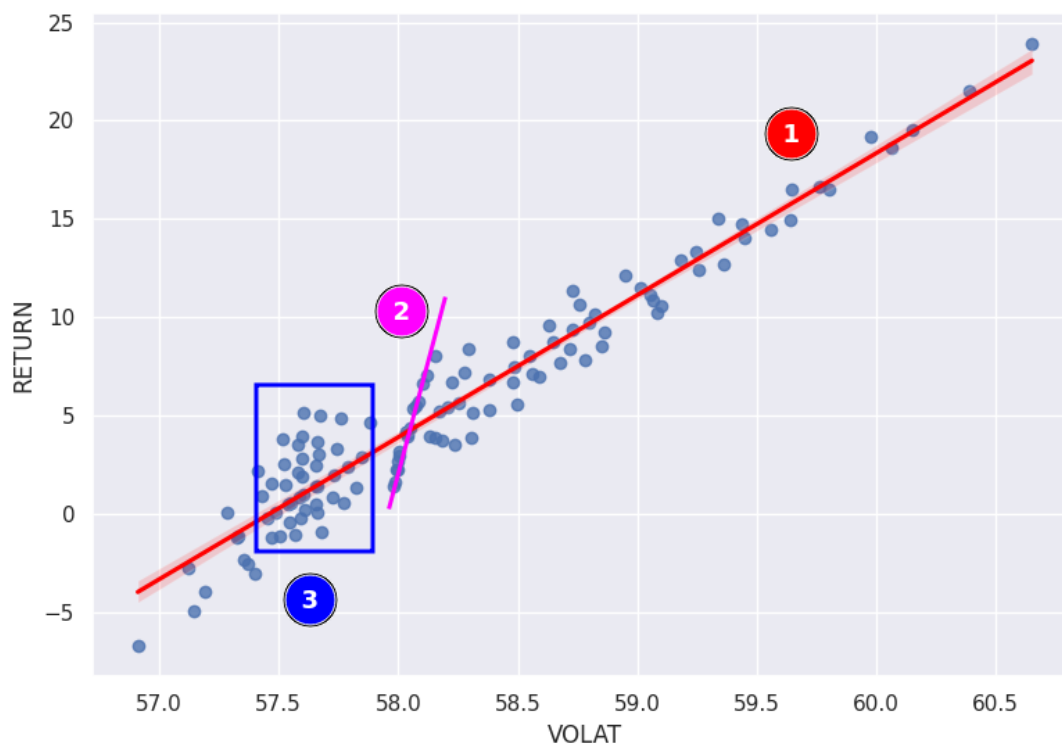


Figure 3: Volatility vs Return trends

To appreciate even more the relationship between risk (volatility) and portfolio return we created a plot by superposing the volatility and return vs portfolio ID in Figure 4. As shown the Return and volatility curve almost overlap which indicate that high risk portfolios have a high return and vice versa.

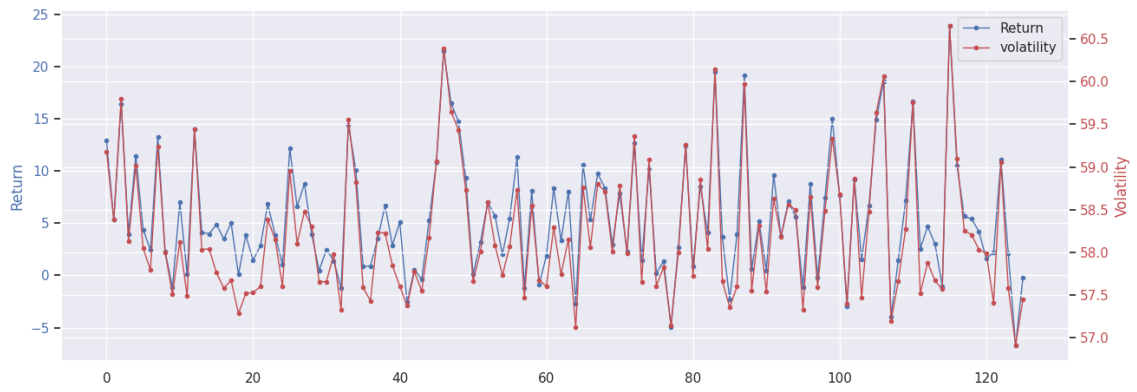


Figure 4: Volatility and Return by portfolio