

Fund Report

Asset Allocation Workshop

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Introduction

We are aware that building a performing portfolio is an extremely difficult task, especially during an historical period like the one that we are now experiencing and being somewhat limited in the choice of financial instruments. Therefore when selecting our investments we decided to adopt a conservative strategy while following the principle rule of diversification. This strategy consisted in dividing our portfolio in 4 main areas (equity, bonds, commodities and liquidity); each area was assigned a weight, corresponding to the percentage of capital invested in that specific area. The choice of the weights was supported by a fundamental analysis of macro economics events, while the division of the amount of each area into the funds that we selected was made accordingly to a statistical evaluation of the past data. More specific information on the fundamental and statistical analysis can be found on the previous report attached to the precise portfolio composition.

In the following lines we would like to present some further reasoning for our decisions regarding the portfolio composition. First of all we decided to invest half of the capital in Fixed income asset, since they're typically less risky than stocks, and at the moment of the construction the portfolio we were not optimistic about the future of the global financial market, as already discussed in the previous report. Still, we assigned a large fraction (27%) of the capital in equity funds as the stock market experienced an incredible growth, despite the slow down in September, during this year. Moreover we wanted to keep a 10% of the capital in liquidity which would then be used to cover transaction and conversion costs. Finally we invested what was remaining in commodities funds, with a small percentage in crypto-currencies to further increase diversification. We decided to build our portfolio using only funds because they typically have diversified positions and are obviously less susceptible to market movements than single stock picking. Among the many funds that were

available we made our selection considering the following conditions:

- . Fund category, equity or bonds fund.
- . Availability of past data, necessary for our optimization model.
- . Morning Star's rating, as indicator of overall quality of the funds
- . Sector of interest, in order to create a diversified portfolio of funds.

Next we discuss the performance of our fund and the changes we intend to implement in the portfolio. This document is divided into the following sections:

- * **Past Performance**
- * **Market overview**
- * **Portfolio Management**

Past Performance

Given the short period of time of the evaluation we considered as a measure for the performance the daily returns, computed according to the formula written below. We decided to use fractional returns instead of logarithmic ones in order to increase the value of the returns in a neighborhood of the initial value (otherwise the returns would be very small, since we are computing them with daily values). Over the period 22/09 - 7/10 our portfolio achieved a positive return of 3.16%. To compute the returns we used the following formula:

$$r = \frac{P_f}{P_i} - 1$$

where P_f and P_i are the final and initial values of the portfolio respectively. **Notice that the values of the portfolio are computed using the adjusted closure price which already take into account dividends, so that we don't have to.** Moreover if we analyze separately the performance of each class we obtain the following results:

- **Equity:** $r = 6.36\%$
- **Bonds:** $r = 0,38\%$
- **Commodities:** $r = 8.20\%$
- **Crypto (ETH):** $r = 14,61\%$
- **Portfolio:** $r = 3.19\%$

We can observe that each area had a positive return over the period taken into consideration. The class with the highest return (excluding Ethereum which represents just the 3% of our capital and had a 14.61% growth in value) is the

commodities class (8.20%), followed by equity (6.36%) and, lastly, bond funds (with just the 0.38%).

Market Overview

24 Sept - 7 Oct 2021

Interest Rates

In the past few weeks we have seen a continuous growth of interest rates and energy prices. As reported by [\[MPS daily 24/10\]](#) many central banks (such as Bank of England) have started to increase interest rates with the hope of counteracting the rise of future inflation expectations (likely caused by the sudden rise of the energy prices). This process is likely to continue since the Fed already stated that early November is when the tapering will start.

Equity Market

September is (so far) the worst month of 2021 for the S&P index which in the last 30 days fell of 4.8 percentage points. ([\[MPS daily 01/10\]](#)) Many stock markets are suffering from the high interest rates and gas prices. Moreover September is third consecutive month characterised by a decrease of consumer's faith, caused by the Delta variant and the rise of prices. On the 5/10 [\[MPS daily 05/10\]](#) reports that the Evergrande Group missed yet 2 debt payments (for a total of 314 mln\$).

Commodities

Energy commodities, particularly gas, have seen an exponential increment in price during the last few weeks, with gas FFT reaching new record values every day. As reported by [\[MPS daily 01/10\]](#) the reasons behind the commodities energy rally may be the massive demand of China and the fear that Europe is lacking gas reserves for the incoming winter. Moreover [\[Financial Lounge\]](#) says that the high price of gas, carbon and electricity forces many industrial companies, especially in Europe, to cut down production. However the European gas lost almost 18% after Putin on the 6/10 declared that Russia has the possibility of exporting record volumes of gas in Europe ([\[MPS daily 07/10\]](#)).

Risk analysis

In order to make a deeper and more complete analysis of our portfolio, we decided to analyze the risk associated with our portfolio obtained after the optimization. In particular, we performed the "statistical bootstrap".

Theory

The statistical bootstrap is very used in risk management field. It belongs to the non parametric approaches as the historical simulation since we do not make any assumption regarding the distribution of risk factors.

This technique uses random sampling with replacement but, differently with respect to the historical simulation, it does not consider all realized returns available, but just a specified number of elements randomly with uniform probability (this makes it very powerful in case of a very large dataset).

To be more specific, we used daily log-returns and valued the loss distribution, the VaR (Value at Risk) and the ES (Expected Shortfall) on the set of returns.

In order to compute the VaR and the ES we decided to use the level of confidence $\alpha = 99\%$, a standard choice when dealing with market risk.

Moreover, in order to have a feedback concerning the estimation of the VaR risk measure, we implemented the "plausibility check VaR" which gives us its order of magnitude. It uses lower, upper percentiles and the signed-VaR for each risk factor:

$$l_i = VaR_{x_i}(1 - \alpha) \quad (1)$$

$$u_i = VaR_{x_i}(\alpha) \quad (2)$$

$$sVaR_i = sens_i \frac{|l_i| + |u_i|}{2} \quad (3)$$

where $sens_i$ is the sensitivity corresponding to the i th-asset.

Hence, the portfolio VaR can be estimated by:

$$Var^{ptf} = \sqrt{sVaR * CsVaR} \quad (4)$$

Results

First of all the plausibility check output is of the same order of magnitude of the other results, being always closer than 1.5% with respect to the VaR obtained via historical simulation. This testifies the reliability of the whole procedure.

The daily Value-at-Risk with 99% confidence is bounded in the interval [2.60% 4.20%] depending on the preferred riskiness. Furthermore the statistical bootstrap highlights the fact that those thresholds could be possibly lowered.

The daily Expected Shortfall with 99% confidence is bounded in the interval [4.90% 6.60%]. The resampled results are scattered along the curve, suggesting it should be fairly accurate.

Portfolio management

Portfolio Re-Structuring

Given the fundamental analysis of the current market situation, we decided to change the weights of the four main areas of the portfolio. Particularly we decided to decrease the by a 10% the weight of the bonds class since, as reported above, we are observing a continuous increase of the interests rates, and we have yet to reach the date of the Fed's tapering. Thus we are incline to believe that rates will continue to grow, meaning a potential loss of our fixed income assets. The 10% cut from the bond funds is shifted to the equity and commodities classes (8% and 2% respectively) that had both a much higher return.

Inside each broad class, we implemented a minimum investment constraint of 2% for each asset. This procedure was performed in order to hold a relatively small quantity of the assets which did not perform as good as expected in the past: this way we may still be able to catch some interesting opportunities without huge risks or the responsibility to turn down entire funds (procedure which would require deeper analysis and comparisons).

The 30% maximum weight cap is instead retained from the past optimisation: it seemed a pleasant compromise between trusting the better performing funds in the short period and the guarantee arising from a diversified portfolio.

Optimisation

As before, once selected the constraints for the main areas of the portfolio, we do the selection of the quantities of the funds via a statistical optimization using the Markowitz model:

1. Collect and clean data up to 1 year in the past (the cleaning consists in filling the blank days with the last available price). The *adjusted closure* prices already include the dividends which therefore must not be reckoned.
2. Set the constraints and compute the efficient frontier.
3. Compute the expected return and volatility of the benchmark.
4. From the efficient frontier, select the portfolio which maximizes the information ratio.

Then we manually adjust the results in order to obtain integer quantities for the funds, taking into account the transaction fees.

References

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