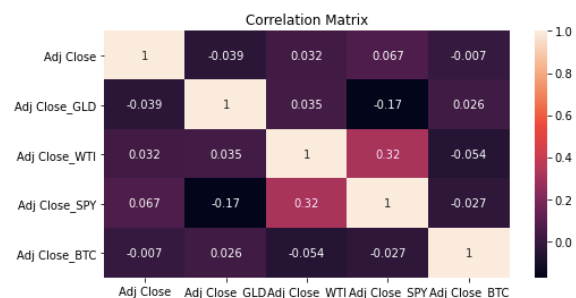


### Summary of Portfolio Construction

- **List of Assets:** 1. **GBPUSD=X**(UK pound value in USD); 2.**GLD**(SPRD Gold shares); 3.**WTI**(price of West Texas Intermediates) crude oil; 4. **SPY**(SPDR S&P 500 Trust ETF) and 5.**BTC-USD** (Bit Coin value in USD)
- **Time period for data:** between 2013 Oct. 30 and 2021 Oct.30
- **Data Source:** Yahoo Finance(GBP, GLD, WTI and SPY), [investment.com](https://www.investment.com) (BTC-USD)
- **Selection Logic:** In this portfolio, BTC has the most significant increase in return, and therefore also has the greatest volatility. Therefore, investing of GBP is added to the portfolio to neutral the risk of value changing in currencies since when the price of BTC goes down, since people look for substitution that can be used to store their value. GLD is also added as a risk neutralization while both GBP and BTC's value decrease. While money/coins depreciates, demand of gold increase since gold as a hard currency is the other way to store values. WTI and SPY are selected as the basic return earning factors and is expected to earn return in a stable way in the portfolio.
- In the first 5 year, these **assets' mean & Std of return and correlation** are summarized as below.

Order	Assets	Mean of return	Std of Return
1	GBP	-0.0164%	0.5873%
2	GLD	-0.0028%	0.9015%
3	WTI	-0.0876%	4.4755%
4	SPY	0.0482%	0.7646%
5	BTC	0.3797%	4.6833%



- **Selection Strategy:** The portfolio can be structured as **equal-weight portfolio** and **risk parity portfolio**. For **equal-weight portfolio**, each asset are purchased by 20% of the budget. After selected data in first five year as training data set, the return curve for the portfolio in the last three years is shown as the blue line. The equal-weight portfolio is expected to grow by 59.73% in the last three years according to its performance in the first 5 years.



- Another way to structure the portfolio is to make it as **risk-parity portfolio**. For this construction, from the 6th year, each asset's distribution is fixed according to their risk contribution to the portfolio. In the 7th and 8th year, each asset's distribution is adjusted accounting to their risk contribution in the previous year. As shown in the red line in the graph, the risk-parity portfolio is expected to grow by 40.23% from Oct. 30, 2018 to Oct.30, 2021.