



What the Fed?

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Objective: Determine trends, performance, and risk

- Create an analysis tool using Python to develop a time series analysis and calculate performance and risk metrics to compare different asset types against the Fed Funds Rate and S&P 500 from 2019-2023.
 - How asset classes perform during shrinking or expanding money supply through fed-fund rate?
 - Are there periods of heightened risk associated with specific interest rate environments?
 - Does the fed fund rate have a significant impact to be considered when building a portfolio?



Asset Definitions and Fed Fund rate to be used for our analysis

Effective Fed Fund Rate (**EFFR**): benchmark rate at which banks lend to each other and is determined by the Fed.

Bitcoin (**BTC**): Bitcoin is a decentralized digital currency

ARKK **ETF (ARKK)**: A fund that invests in high risk companies

S&P 500 **ETF (SPY)**: A fund that invests in 500+ biggest U.S based companies

FGRTX **Mutual Fund**: Balanced Risk Mutual Fund that invests in high performing large companies 50% Stocks and S-T instruments 50%

IWM Bond **Fund**: Tracks the 10 year yield bond

Our data- Cleaning & Processing





Data sources and Cleaning

- **Sources:**
 - Alpaca API
 - CSV File FGRTX yahoo finance site
 - CSV File New York Federal Reserve U.S Government Database
 - API CoinGecko
- **Cleaning methods:**
 - Dropped nulls, na's
 - Converted index into DateTime index (sort)
 - Checking Datatypes
 - Added final results into a main dataframes for calculating and graphing

	FGRTX	SPY	ARKK	IWM	BTC
Date					
2019-02-15	10.775713	277.38	45.19	156.19	3601.229191
2019-02-19	10.797307	277.88	45.22	156.65	3915.009971
2019-02-20	10.804506	278.43	45.59	157.39	3976.808907
2019-02-21	10.754117	277.46	44.70	156.80	3934.813594
2019-02-22	10.811703	279.16	45.77	158.15	3973.641323
...
2023-12-22	20.889999	473.65	53.01	201.48	44003.696022
2023-12-26	20.969999	475.65	53.79	204.10	42516.426940
2023-12-27	20.980000	476.51	54.26	204.82	43418.467775
2023-12-28	20.969999	476.69	54.14	204.04	42600.650633
2023-12-29	20.940001	475.31	52.37	200.71	42074.707156



Library used: from Scipy import Stats

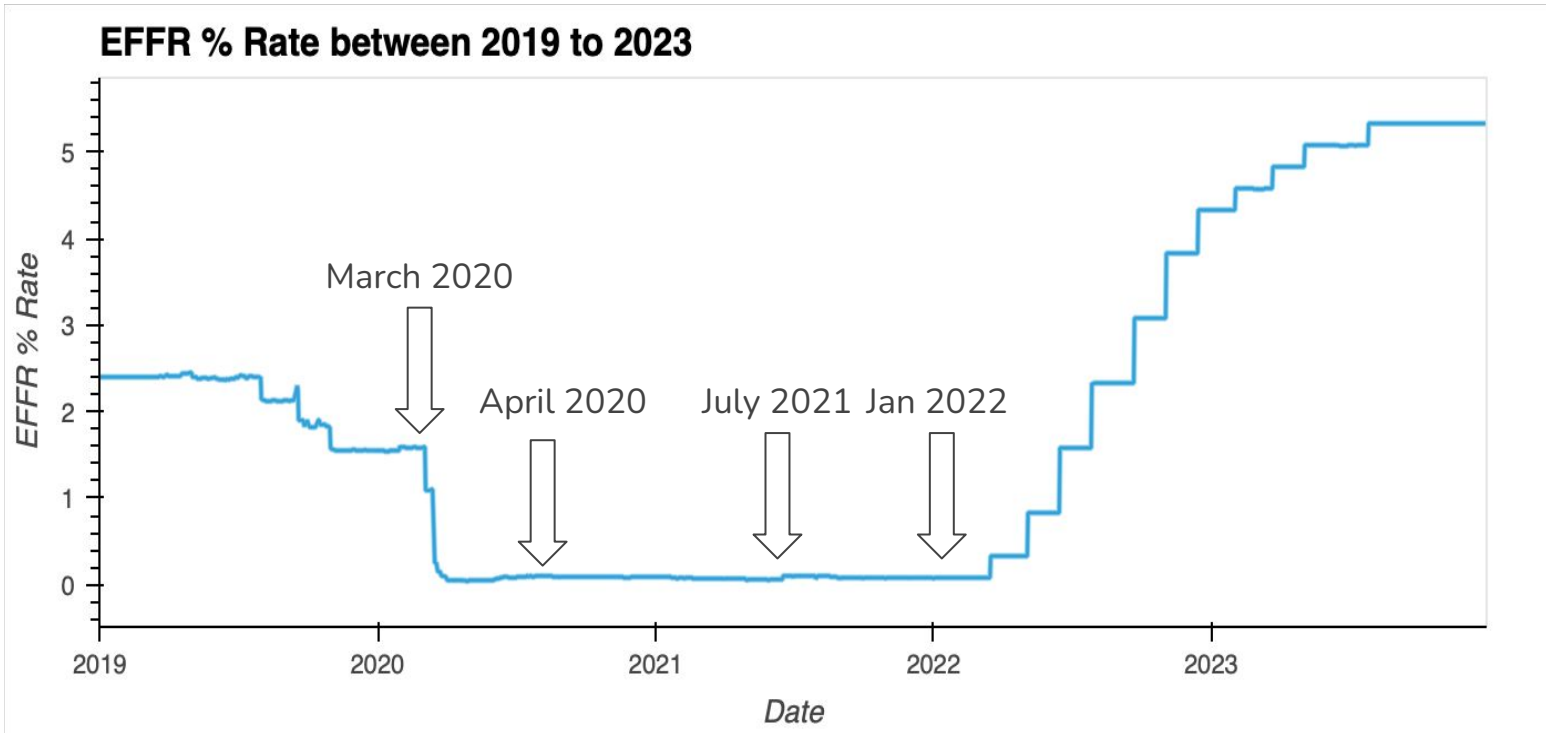
- Using the machine-learning library to find Linear Regression
 - SPY500 vs. other asset classes
 - Fed Fund rate vs. other asset classes
- Cleaning method:
 - Converted into numpy and reshaped the list into (-1,1)
 - Used the LinearRegression().fit() to determine the line of best fit

S&P500 versus Assets over 1200+ trading days		Linear regression R2
S&P500 correlated to FGRTX		0.906732
S&P500 correlated to IWM		0.770514
S&P500 correlated to ARKK		0.497208
S&P500 correlated to BTC		0.103495
Fed Fund Rate vs. Daily Returns of Asset Classes		Linear regression R2
Fed Fund Rate vs. ARKK		1.158469e-04
Fed Fund Rate vs. IWM		7.587085e-05
Fed Fund Rate vs. Bitcoin		2.583437e-05
Fed Fund Rate vs. FGRTX		3.784268e-06
Fed Fund Rate vs. S&P500		7.566458e-07

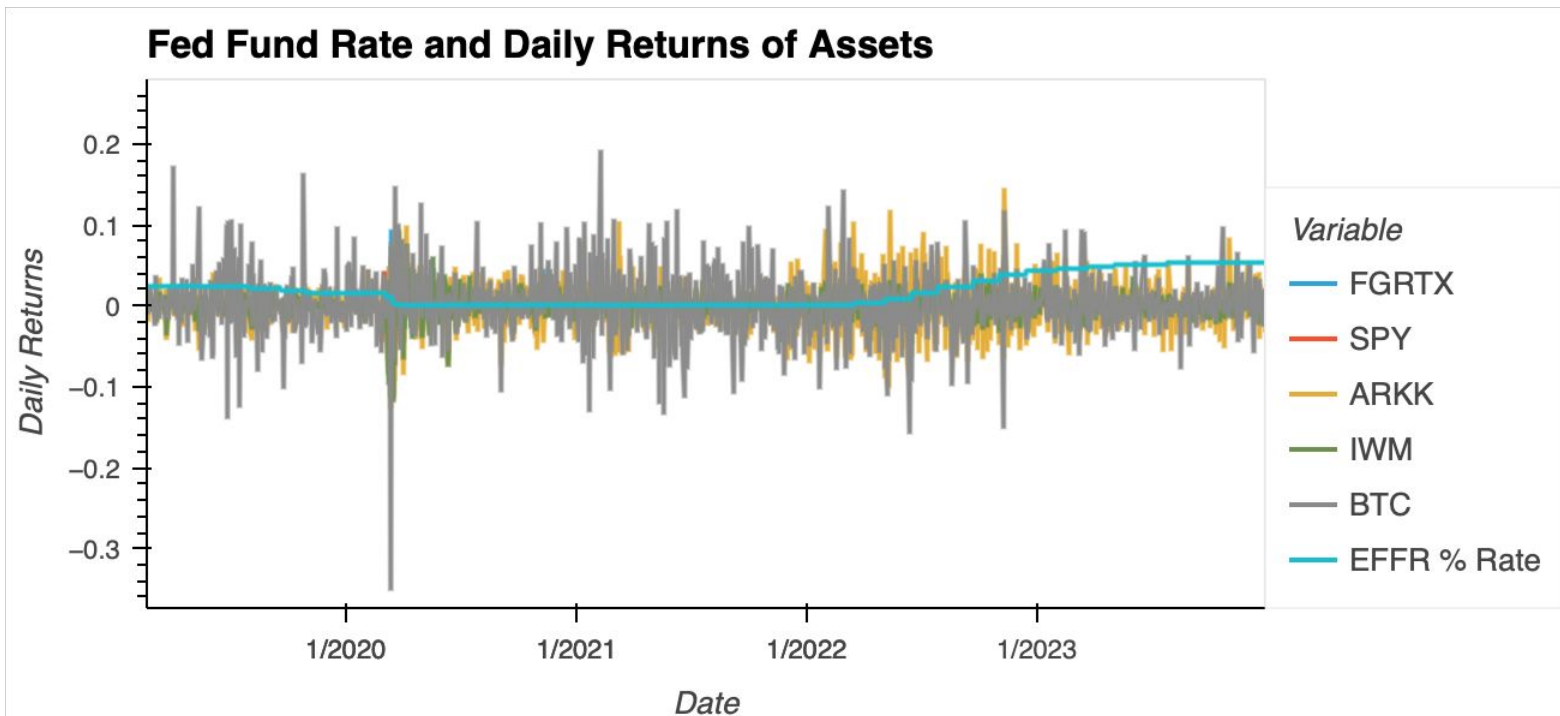
Analysis



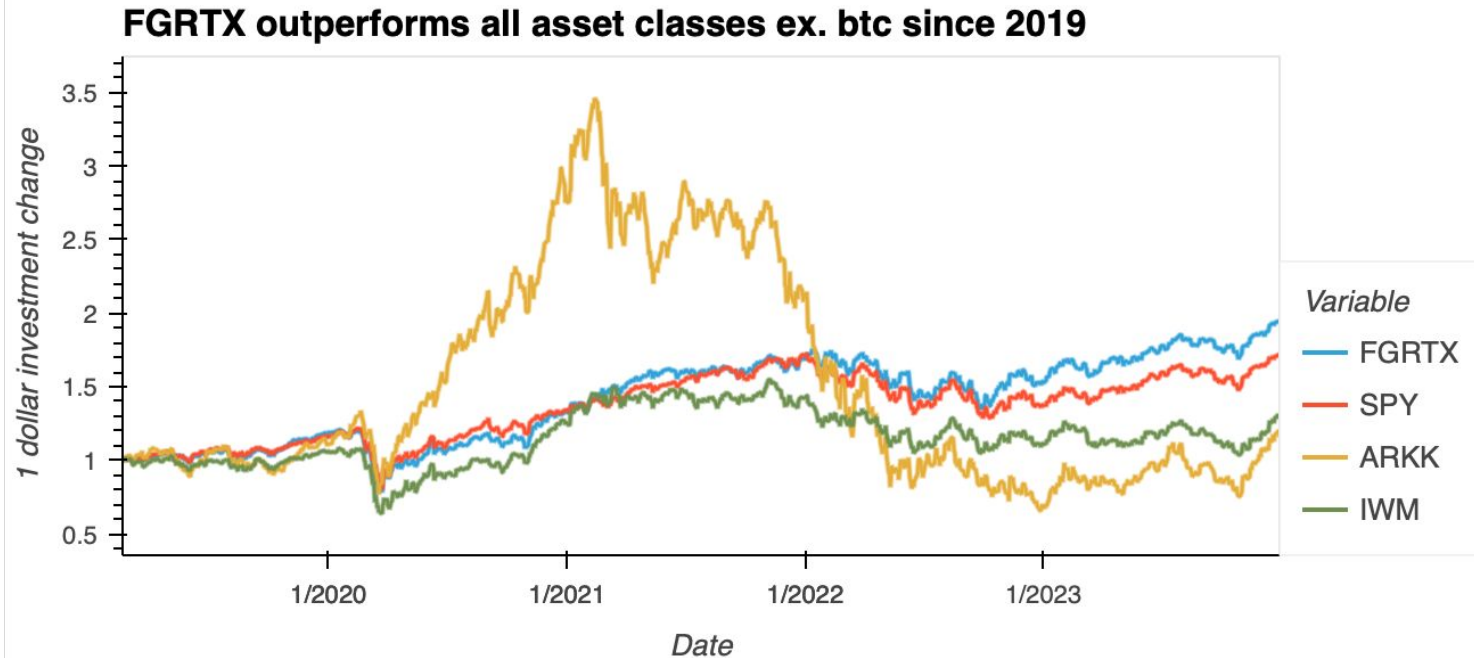
EFFR rate swung from 0% to 5% in 5 years



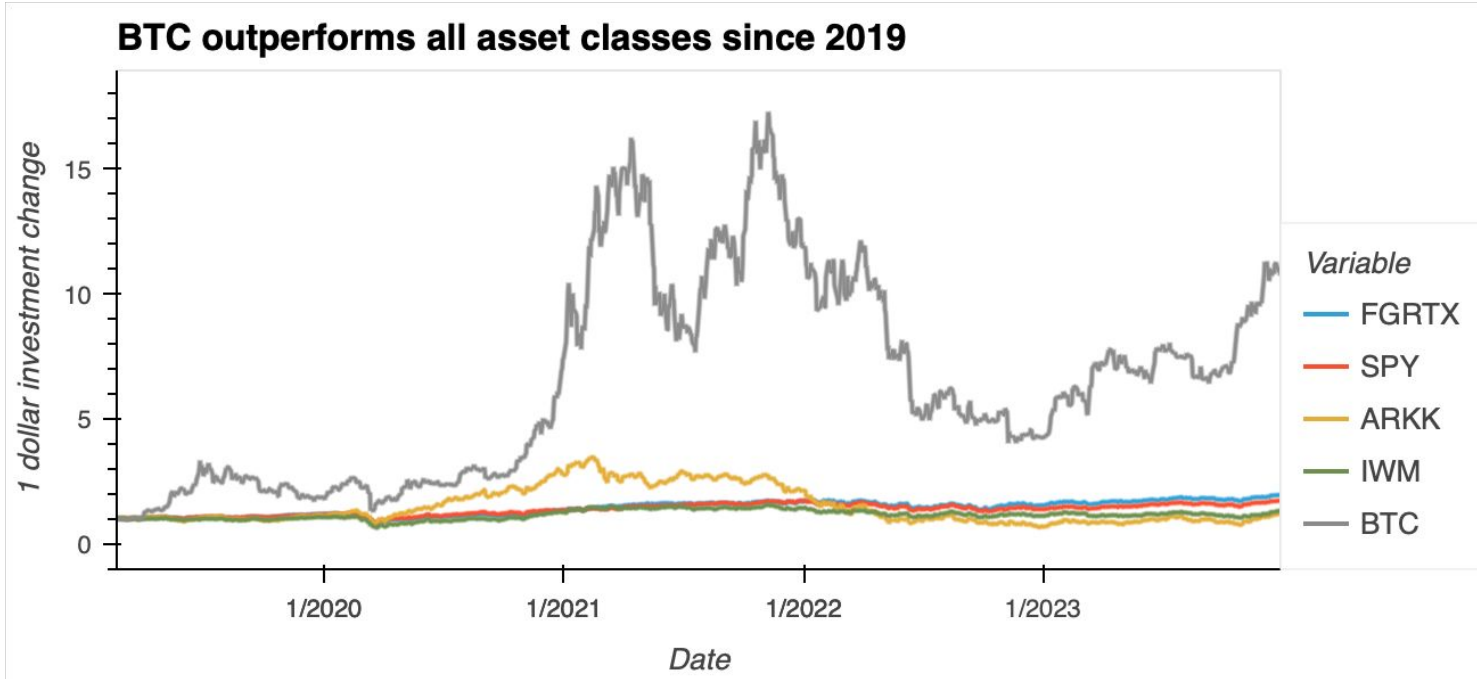
Fed Fund Rate vs. Daily Returns



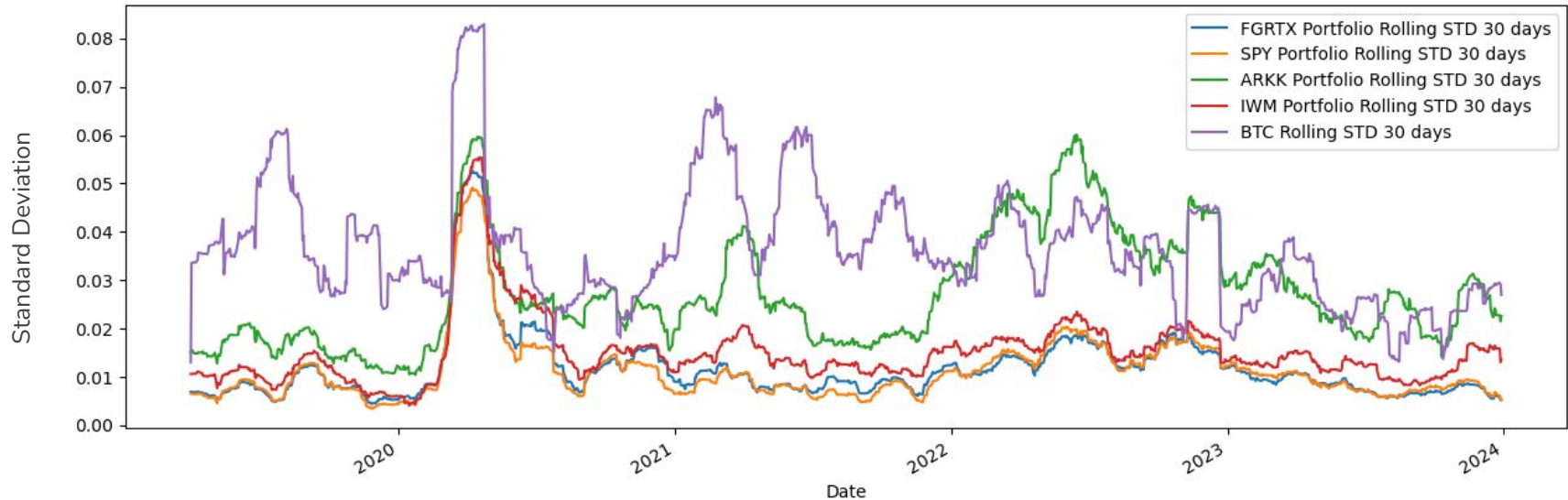
FGRTX leads the way in stocks & bonds



BTC outperforms all asset classes since 2019



Rolling STD 30 days of all assets

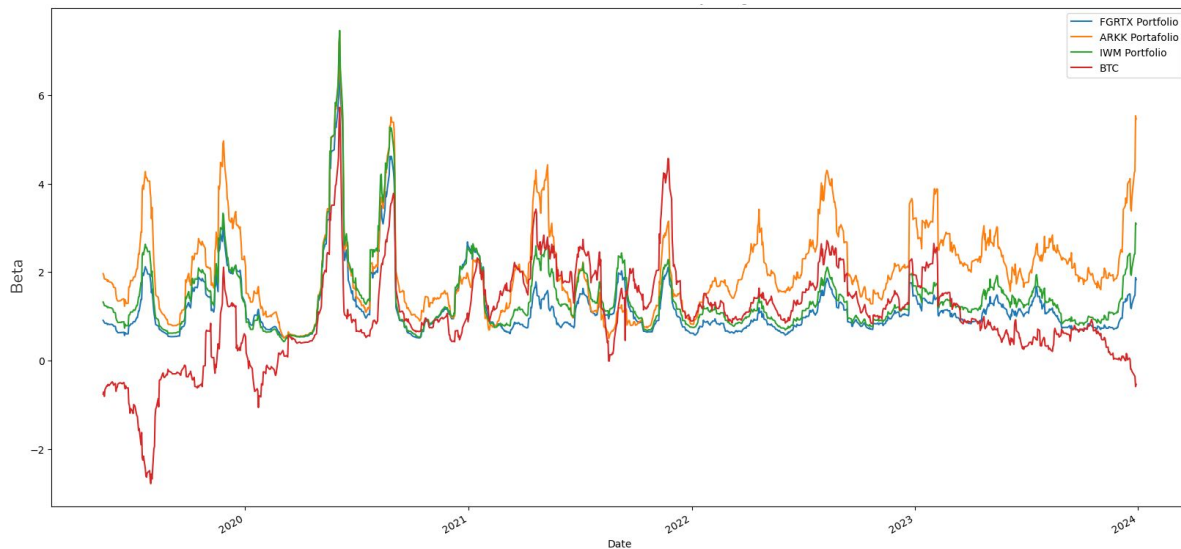


FGRTX has similar volatility to the S&P500 and Bitcoin has the most pronounced

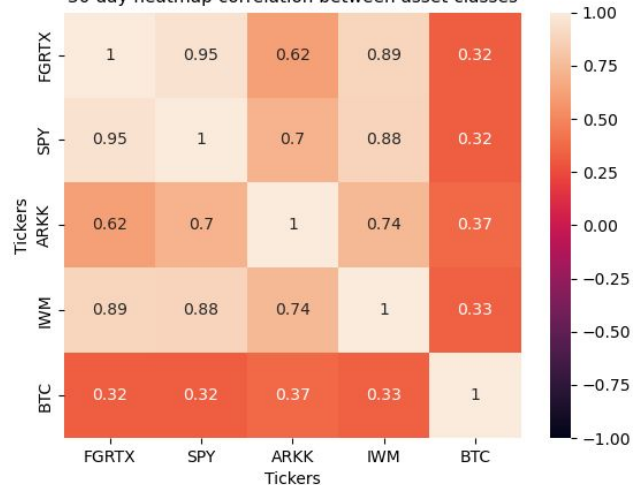


Assets ex. BTC saw increase in correlation vs. the SPY by 2024

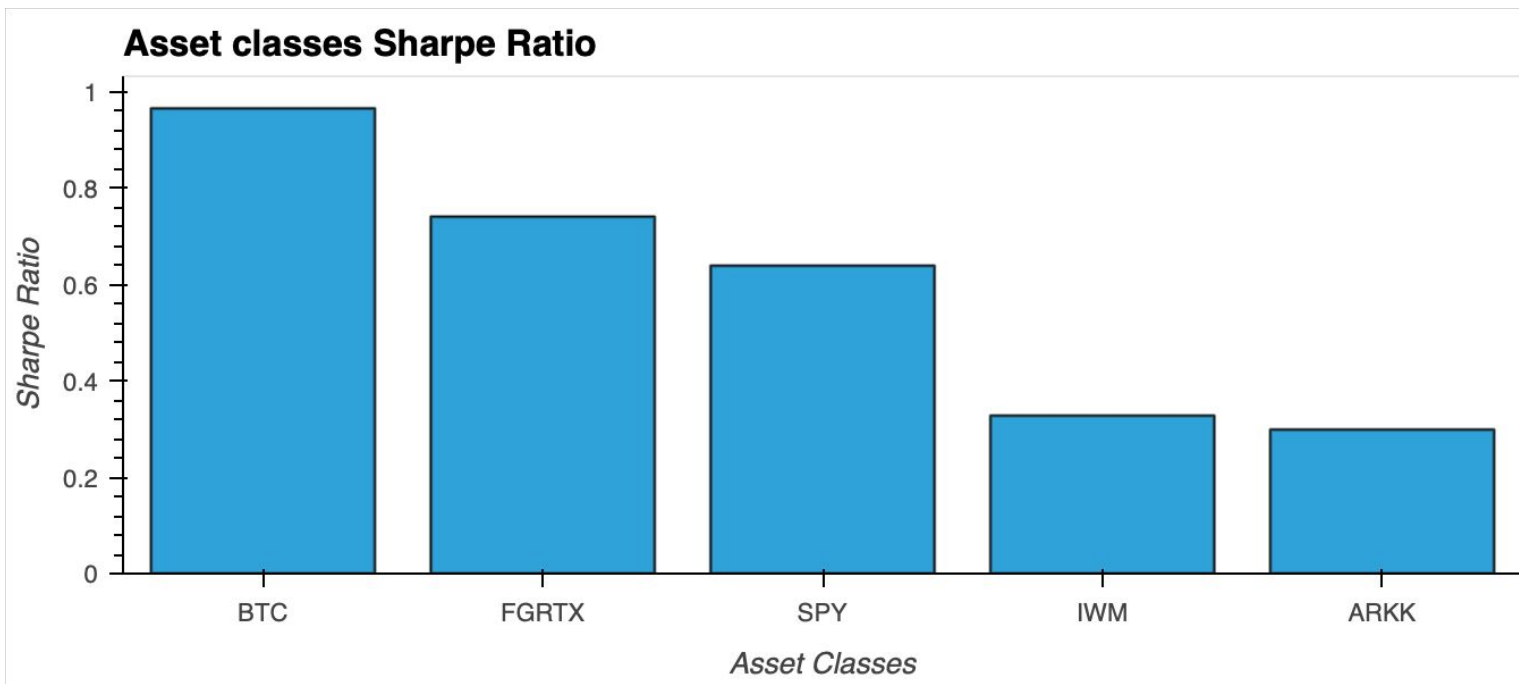
All asset Portfolio Beta Trend 60 day rolling



30 day heatmap correlation between asset classes

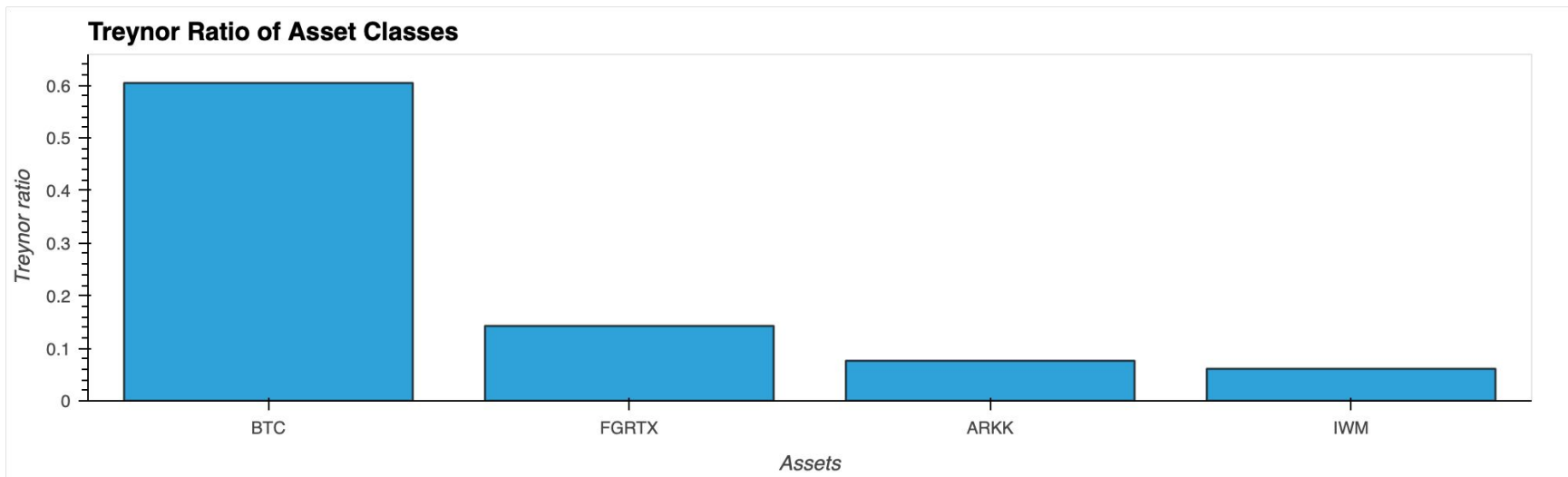


BTC has the highest Sharpe Ratio

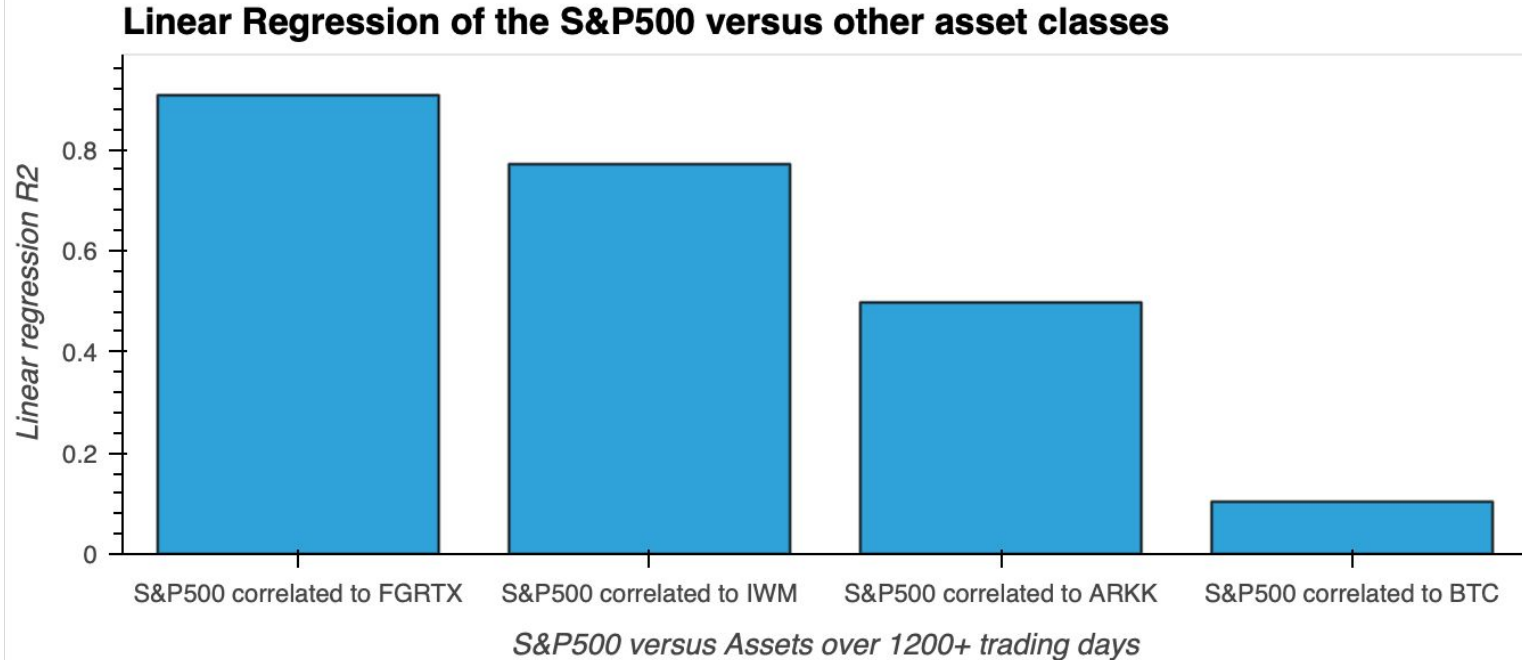




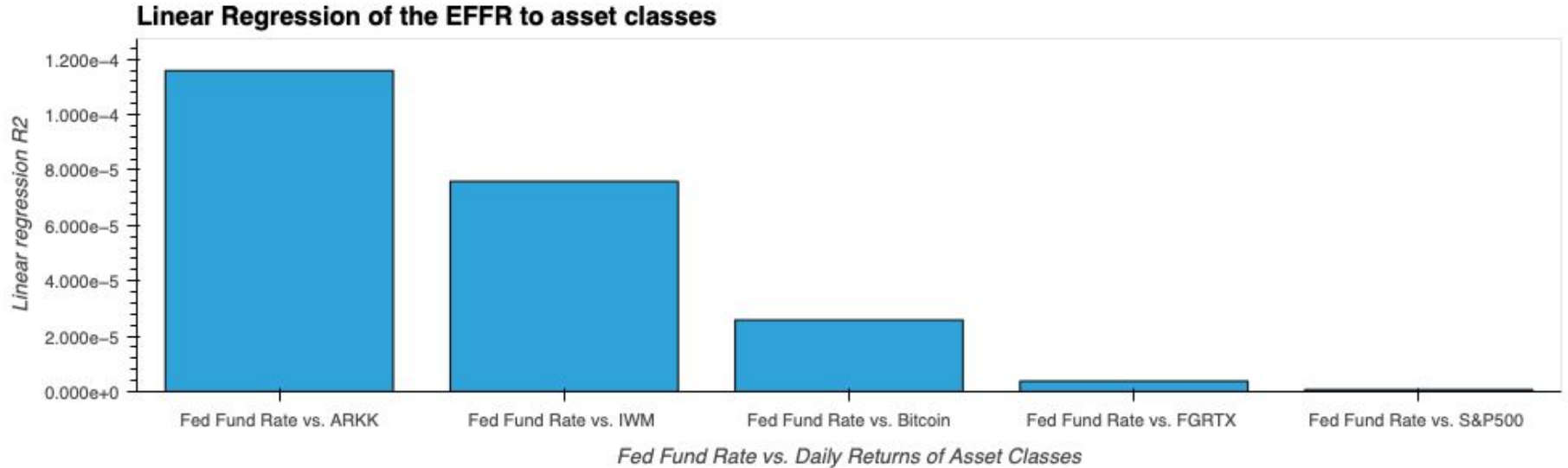
BTC has the highest Treynor Ratio



FGRTX has the highest R2 to the S&P500



EFFR has the smallest R2 to asset classes



Conclusion





Conclusion - Fed Fund Rate is ineffective

- How asset classes perform during shrinking or expanding money supply through fed-fund rate
- Are there periods of heightened risk associated with specific interest rate environments?
- Does the fed fund rate have a significant impact to be considered when building a portfolio



Future Questions

- What forecasting modelling would fit to determine future performance of these assets?
- To what extent does valuation metrics play a role in stock performance over time?
- What trading strategy can be employed from looking at company fundamentals and valuation? Are there other appropriate benchmarks other than the S&P 500 in a more tech-centric world.

Questions?

