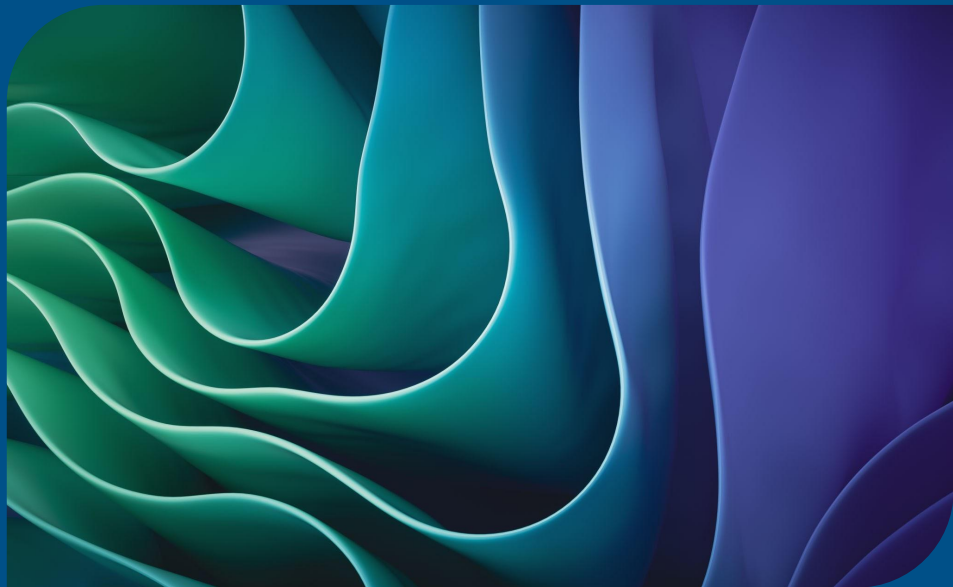


Healthcare- DrugManufacturers

Alex Ng
Kaiqi Jiang
Qi Wang
Yingxin Liang

Lorem Ipsum



1. **Daily Returns and Summary Stats**
2. **Portfolio Optimization**
3. **Fitting CAPM**
4. **VaR & ES**
5. **Conclusion**

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Top 3 Companies

Pfizer Inc. (PFE)

Johnson & Johnson (JNJ)

AbbVie Inc. (ABBV)

Index Choice

S&P 500 - Pharmaceuticals (Indu (^SP500-352020))

☆ Follow

1,084.67 +0.35 +(0.03%)

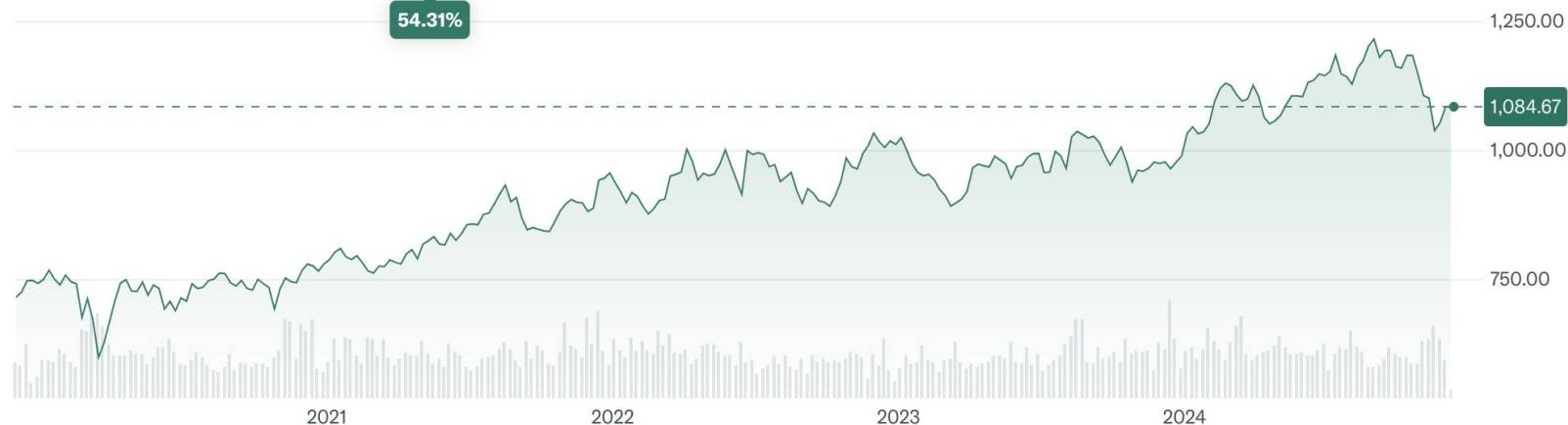
At close: 5:04 PM EST

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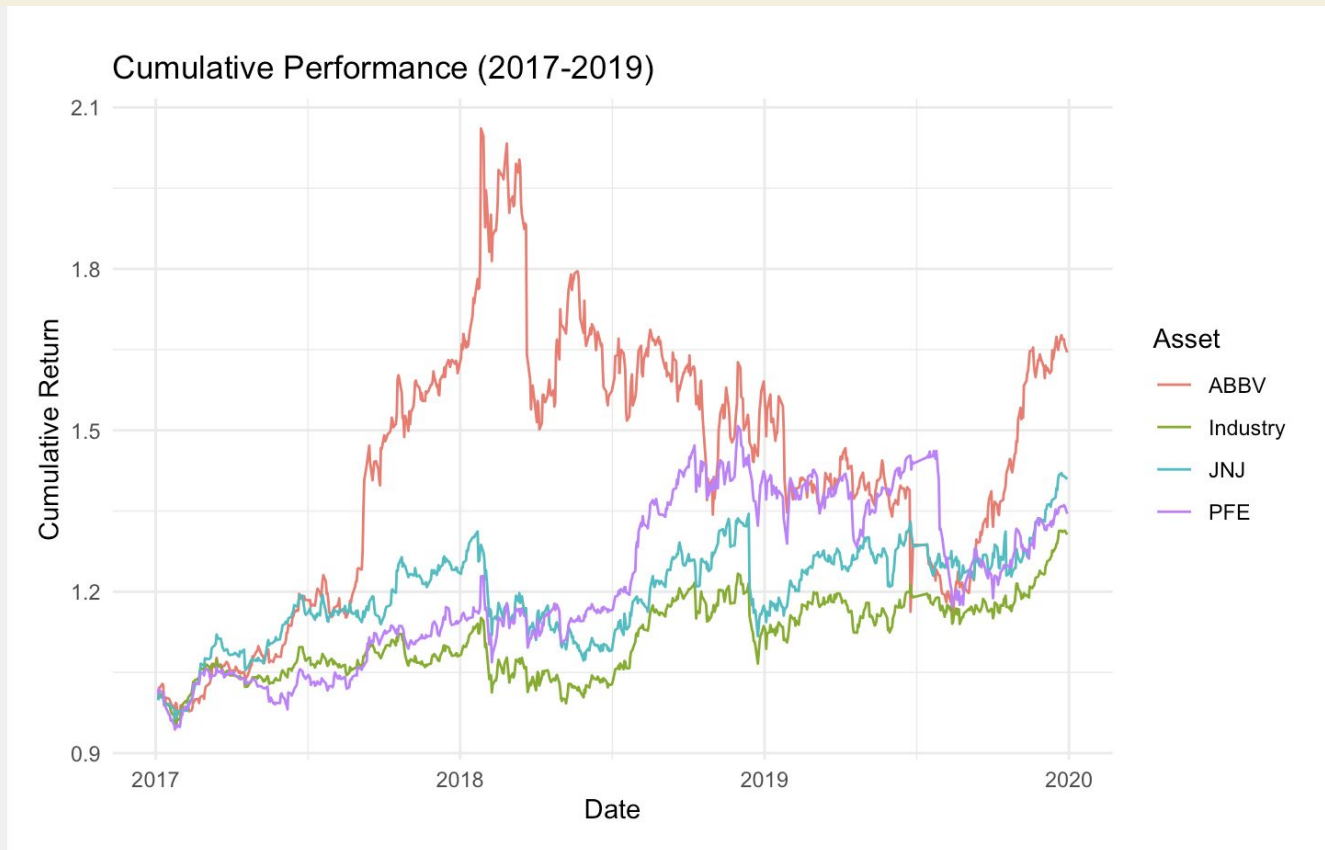
1D 5D 1M 6M YTD 1Y **5Y** All

☒ Key Events ▲ ▼ ↗ ⚙



Previous Close	1,084.32	Volume	85,735,633	52 Week Range	802.33 - 1,087.76
Open	1,087.76	Day's Range	1,080.53 - 1,087.76	Avg. Volume	86,702,867

Cumulative Performance (2017-2019)



Summary Statistics for 2017 – 2019

Mean for Daily Returns by year and industry

Asset	2017	2018	2019
Drug Industry(%)	0.032	0.026	0.061
PEE(%)	0.055	0.096	-0.016
JNJ(%)	0.088	-0.011	0.081
ABBV(%)	0.196	0.021	0.029

Standard Deviation for Daily Returns by year and industry

Asset	2017	2018	2019
Drug Industry(%)	0.574	1.103	0.828
PEE(%)	0.702	1.194	1.194
JNJ(%)	0.722	1.380	1.013
ABBV(%)	1.106	2.217	1.730

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Tangency Portfolio and Risk Analysis

$$w = \frac{\Sigma^{-1}(\mu - r_f \mathbf{1})}{\mathbf{1}'\Sigma^{-1}(\mu - r_f \mathbf{1})}$$

Asset	Weights
PFE (Pfizer)	0.229
JNJ (Johnson & Johnson)	0.482
ABBV (AbbVie)	0.289

Asset/Portfolio	Standard Deviation	Sharpe Ratio
PFE	1.074	0.041
JNJ	1.072	0.046
ABBV	1.744	0.045
Industry	0.863	0.044
Optimal Portfolio	0.993	0.057

2017-2019 v.s. 2020-2022 (Same portfolio)

Asset (2017-2019)	Mean Daily Return (%)	Cumulative Return (%)	Standard Deviation	Sharpe Ratio
Industry	0.042	132.594	0.863	0.044
Optimal Portfolio	0.060	150.577	0.993	0.057

Asset (2020-2022)	Mean Daily Return (%)	Cumulative Return (%)	Standard Deviation	Sharpe Ratio
Industry	0.049	137.823	1.306	0.034
Optimal Portfolio	0.071	160.180	1.332	0.051

2017-2019 v.s. 2020-2022 (New portfolio)

Asset (2017-2019)	Mean Daily Return (%)	Cumulative Return (%)	Standard Deviation	Sharpe Ratio
Industry	0.042	132.594	0.863	0.044
Optimal Portfolio	0.060	150.577	0.993	0.057

Asset (2020-2022)	Mean Daily Return (%)	Cumulative Return (%)	Standard Deviation	Sharpe Ratio
Industry	0.049	137.823	1.306	0.034
Optimal Portfolio	0.126	227.305	1.856	0.066

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CAPM Model

$$R_{i,t} - r_{f,t} = \alpha_i + \beta_i(\mu_{M,t} - r_{f,t}) + \epsilon_{i,t}$$

- Here we take risk free asset as a time series.
- Fitting for data from 2017 to 2019 and data from 2020 to 2022 separately.

CAPM Model For 2017–2019

	Industry	Pfizer	AbbVie	J&J	Optimal pf
Alpha	0	0	0	0	0
Beta	0.730	0.762	1.062	0.669	0.786
P-value	0.909	0.92	0.662	0.764	0.646

CAPM Model For 2020–2022

	Industry	Pfizer	AbbVie	J&J	Optimal pf
Alpha	0	0.001	0.001	0	0
Beta	0.576	0.574	0.592	0.539	0.562
P-value	0.449	0.389	0.079	0.556	0.175

1. Daily Returns and Summary Stats
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Daily VaR and ES Analysis: 2017–2019

Asset <chr>	VaR (5%) <dbl>	ES (5%) <dbl>
Industry	1.402	2.180
PFE	1.620	2.646
JNJ	1.476	2.722
ABBV	2.441	4.110

- Non-Parametric Method Analysis at 5% Significance Level
- The industry index demonstrates the lowest risk and greatest stability.
- Pfizer and J&J show moderate risk profiles.
- AbbVie exhibits the highest volatility and downside risk.

Comparison of Daily VaR and ES: 2017–2019 vs. 2020–2022

Asset <chr>	VaR (5%) <dbl>	ES (5%) <dbl>
Industry	1.785	2.851
PFE	2.547	4.043
JNJ	1.887	3.149
ABBV	2.217	3.881

- Market risk increased significantly during 2020–2022 for most assets, driven by broader volatility (e.g., COVID-19).
- Industry Index: Lowest risk in both periods, highlighting diversification benefits.
- Pfizer: Most significant increase in risk metrics, reflecting market sensitivity.
- AbbVie: Highest risk but slightly improved in the latter period. (beta<0)

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Findings and Insights:

Lessons from 2020–2022

- Pharmaceutical industry's unique position during the pandemic
- Market beta: 2020–2022 showed increased sensitivity
- Tail risk: 2020–2022 carried less downside risk
- The importance of understanding sector-specific trends

It is a great time to share with you!