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Correlation between the Fed Pandemic Policy and the S&P 500 Technology Sector Performance

Abstract

The technology sector weighting for the S&P 500 Index has reached a weight of more than a quarter end of 2021. At the same time inflation fears drove U.S. treasury yields significantly beginning of 2022. This paper analyzes the prevailing view that this has a negative effect on technology stocks performance and that these are affected by interest rate hikes. The performance of the S&P500 and S&P 500 ex information & technology & communication services vs. U.S. interest rates from 2020 to 2021 and for 2022 is examined. The assumption is that the outperformance of the S&P 500 technology sector was based on the Fed policy and there will be a mean-reversion process with a regime shift. Furthermore, the hypothesis that the higher interest rates at the end of the pandemic the higher the mean reversion process is discussed. Finally, research on other sectors and Euro Stoxx 600 is recommended.

Keywords

S&P 500, technology sector, mean reversion, interest rates

JEL classification

F30

Introduction

In 2022 the interest rate environment globally changed after the Covid 19 pandemic with rising rates based on increased inflation. With this regime shift of central banks the prevailing scientific opinion is that this environment weighs on technology stocks and that this sector is particularly affected by rate hikes (Ghosh et al 2022). The logic behind this theory is that bond yields are more attractive with rising interest rates than stocks and with lower risk. This effect affects the global stock market. However, future cash inflows also lose value in the case of stronger growing companies. Due to higher interest rates, discounted cash value decreases. In addition, it becomes more expensive for companies, to finance themselves with debt (Motley Fool 2021). The high inflation drove U.S. government bond yields whereupon equity markets around the world lost value, led by U.S. tech stocks.

The key 10-year U.S. government bond rate at times exceeded several new highs in 2022. However, since inflation reduces the real interest rate, many bond investors sold their exposure. The dynamic was mainly triggered by increased bond yields which are similar like the average dividend yield in the S&P 500 index. The new regime hit tech stocks particularly hard, expressed by drops in the Nasdaq (Gupta 2022). After all, the high valuations of most tech companies are based less on current dividends than on the hope of reaping high returns in the future. If these earnings are discounted to the present, values are significantly lower with higher actuarial interest rates. Although fundamental data of the companies had not changed, the basis for calculation, the interest rate, melted away. The effects of the discounted cash flow method are particularly strong for technology stocks (Heyden 2021). Traditional companies, such as utilities or consumer goods, are less affected by this mechanism. Banks are among the winners in this environment as well, as higher interest rates again create more scope for interest rate margins (Sullivan 2022). This results in the aim to examine the hypothesis that the higher the interests at the end of the pandemic the higher the mean reversion process for the highly capitalized S&P 500 technology sector. In this paper, the performance of the S&P500 is compared with the S&P 500 ex information & technology & communication services vs. U.S. interest rate policy during the pandemic from 2020–2021 and for the regime shift of the central bank in 2022 is analyzed. In the first step the performance impact on the highly capitalized technology sector of the S&P 500 is examined. Important findings are, that the performance of the S&P 500 is higher during the pandemic and lower after the central bank regime shift in 2022 than for the S&P 500 ex information & technology & communication but there is no linear correlation between U.S. interest rates and the performance of S&P 500 and S&P 500 ex information & technology & communication services from 2020 to 2021. Chapter four of the paper examines a potential correlation between interest rate hikes and S&P sector performance. To account for the potential interest rate sensitivity the paper looks at the distribution of performance data. Finally, the question whether there is a mean reversion process for the S&P 500 technology sector is answered via a regression analysis for performance and interest rate data. Chapter five concludes with the findings.

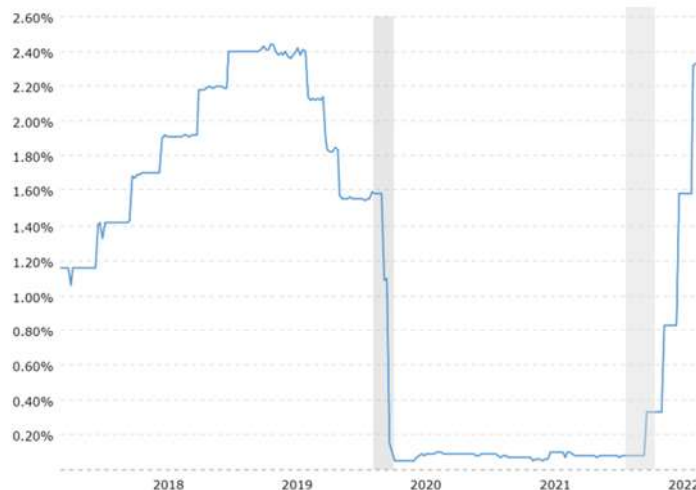
1 U.S. Interest rate impact on S&P 500 performance

For this paper the performance data of the S&P 500 is compared with the S&P 500 ex information & technology & communication for two phases of Fed policy, during the pandemic from 2020 to 2021 and for the regime shift from January 2022 until July 2022.

1.1 2020 to 2022

The following figure illustrates the historical U.S. interest rates for a 5 Year period. The data shows the massive decrease in interest rates beginning of the pandemic and the regime shift of the Fed with increasing inflation beginning of 2022. Based on this, the performance of the S&P 500 is analyzed for these two phases in the following chapters of this paper.

Figure no. 1: 5 Years U.S. interest rate



Source: macrotrends

Official S&P performance data shows that the performance of the S&P 500 is higher during the pandemic and lower after the central bank regime shift in 2022 (tradingview 2022)

Figure no. 2: S&P 500 performance from Jan 2020 to July 2022



Source: TradingView

Dow Jones Market Data evaluated the five most recent rate hike cycles to show stock market returns in these periods. The analysis illustrates that during these periods, the S&P 500 only declined during one rate hike cycle.

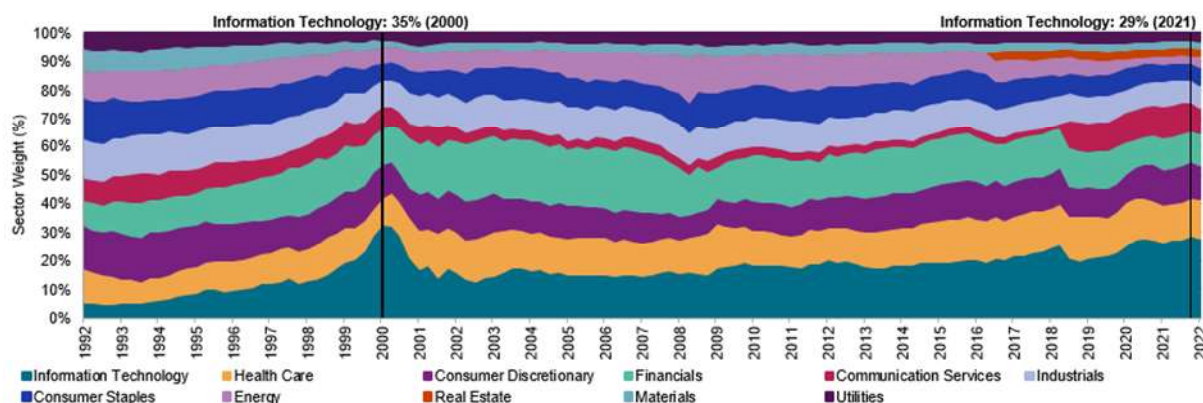
Table no. 1: Rate hike cycles from 1994 to 2019

Rate Hike Cycle	DJIA	S&P 500	Nasdaq
Feb. 1994 to July 1995	16.30%	13.80%	18.10%
March 1997 to Sept. 1998	17.40%	32.60%	40.00%
June 1999 to Jan. 2001	-1.60%	-5.00%	-13.30%
June 2004 to Sept. 2007	28.70%	30.00%	26.90%
Dec. 2008 to July 2019	213.70%	243.10%	442.00%
Average % Change	54.90%	62.90%	102.70%
Median % Change	17.40%	30.00%	26.90%

Source: Dow Jones Market Data

In the next step the sector exposure is reviewed with the help of a historical flow charts for the S&P 500 to identify the sector performance for the two periods investigated.

Figure no. 3: S&P 500 sector exposure as of March 2022



Source: S&P Dow Jones Indices LLC

The chart of figure 4 shows a sector exposure of 29 percent for the information and technology sector in 2021 which raises the question of the performance contribution during the pandemic and after the regime shift in 2022. Therefore, the sector performance breakdown during the pandemic from 2020 to 2021 and for the regime shift of the central bank in 2022 is evaluated based on S&P data in the next step.

Table no. 2: S&P 500 sector performance from 2020 to July 2022

Sector		2020	2021	YTD
S&P 500 Consumer Discretionary Index	COND	33,3	24,4	-32,8
S&P 500 Consumer Staples Index	CONS	10,8	18,6	-5,6
S&P 500 Energy Index	ENRS	-33,7	54,6	31,8
S&P 500 Financials Index	FINL	-1,7	35,0	-18,7
S&P 500 Health Care Index	HLTH	13,5	26,1	-8,3
S&P 500 Industrials Index	INDU	11,1	21,1	-16,8
S&P 500 Information Technology Index	INFT	43,9	34,5	-26,9
S&P 500 Materials Index	MATR	20,7	27,3	-17,9
S&P 500 Real Estate Index	REAL	-2,2	46,2	-20,0
S&P 500 Communication Services Index	TELS	23,6	21,6	-30,2
S&P 500 Utilities Index	UTIL	0,5	17,7	-0,6
S&P 500 Index	S&P	18,4	28,7	-20,0

Mean	10,9	29,7	-13,3
Median	11,1	26,1	-17,9
1st Quartile	-1,7	21,1	-26,9
3rd Quartile	20,7	35,0	-5,6

Source: S&P Dow Jones Indices LLC

Figure 5 illustrates the significant performance contribution of the technology and communication services sector during the pandemic in 2020 and 2021. Furthermore, the data shows a significant underperformance of both sectors after the Fed regime shift in 2022. Based on the sector performance data the following hypotheses are defined:

H1: The performance of the S&P 500 is higher during the pandemic and lower after the central bank regime shift in 2022 than for the S&P 500 ex information & technology & communication.

H2: There is a high correlation between U.S. interest rates and the performance of S&P 500 and S&P 500 ex information & technology & communication services.

H3: There is a mean reversion process with a regime shift of U.S. interest rate policy after the pandemic.

For further research the following descriptive statistical methods are used to evaluate a potential correlation between the Fed pandemic policy and the S&P 500 technology sector performance:

1. Distribution: mean, variance, quartile
2. Boxplot: density distribution and median
3. Histogram: performance distribution
4. Simple regression and Pearson correlation: potential correlation between interest rates and performance

2 Chapter

There are several indicators for a potential correlation between Fed interest rate hikes and S&P sector performance discussed in the previous chapter. Based on these, the daily performance of the S&P 500 and S&P 500 ex information & technology & communication services is analysed in this chapter for a potential correlation. The S&P 500 without technology sectors does not include companies like Apple, Microsoft and Alphabet and is therefore used as comparative. Both indices are defined as dependent variables and interest rates as independent variable with the following parameter:

Table no. 3: Examination Parameters

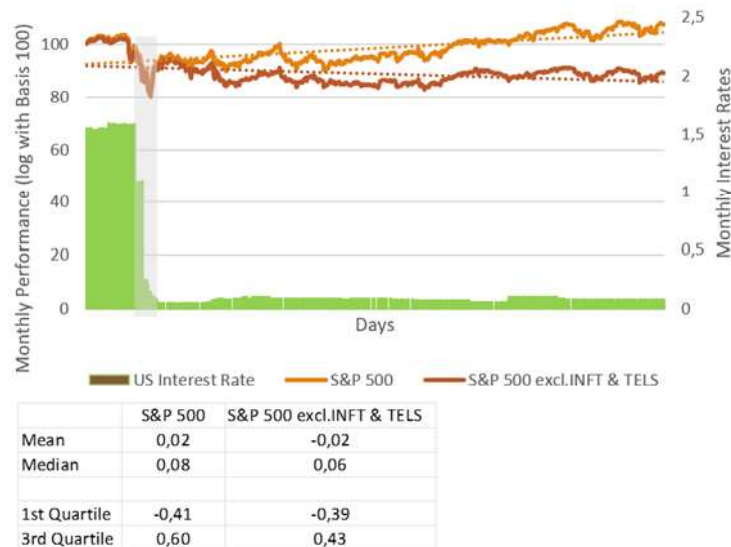
Variable	Name	Observations 2020-2021	Observations 2022
Y_1	S&P 500	505	144
Y_2	S&P 500 excl.INFT & TELS	505	144
X	Interest Rate	505	144

Source: Author's own according to S&P data

2.1 Distribution

In the first step the performance distribution is plotted against the interest rates for the pandemic period for 505 data points.

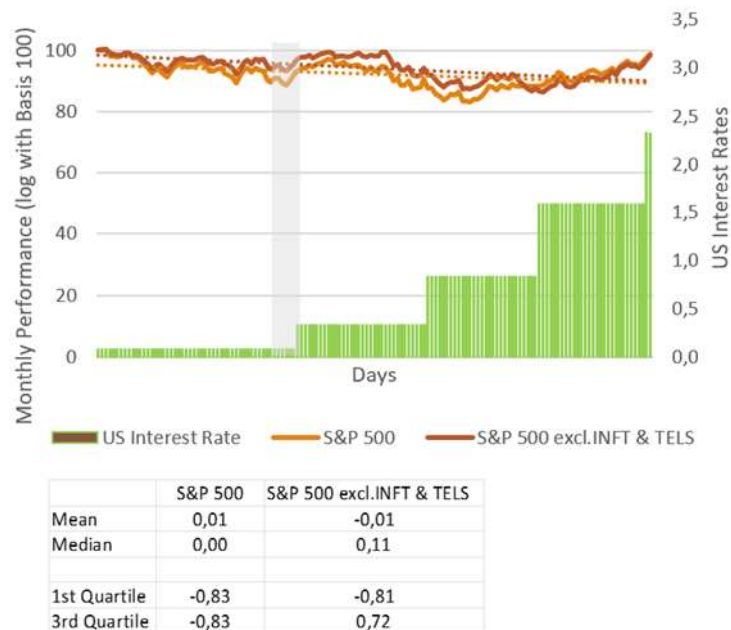
Figure no. 4: S&P 500 vs. S&P 500 excl. INFT & TELS from 2020 to 2021



Source: Author's own according to S&P data

In addition, the performance distribution is plotted against the interest rates for the Fed regime shift for 144 data points.

Figure no. 5: S&P 500 vs. S&P 500 excl. INFT & TELS from January to July 2022



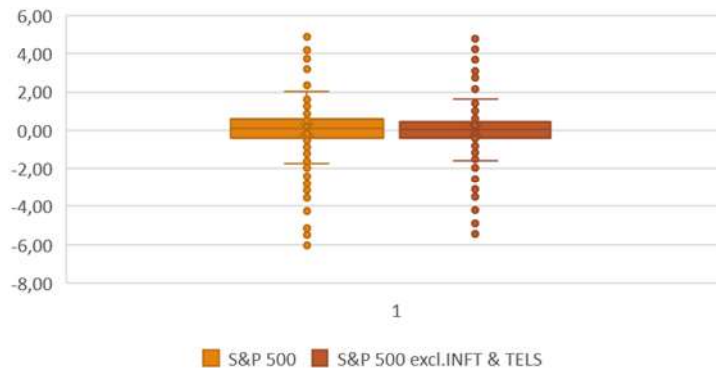
Source: Author's own according to S&P data

The data shows higher performance for the S&P 500 during the pandemic and lower performance after the central bank regime shift in 2022 than for the S&P 500 ex information & technology & communication which confirms H1.

2.2 Boxplot

In the next step, Boxplots charts are used for the same evaluation periods to confirm the results of the distribution charts.

Figure no. 6: S&P 500 vs. S&P 500 excl. INFT & TELS from 2020 to 2021

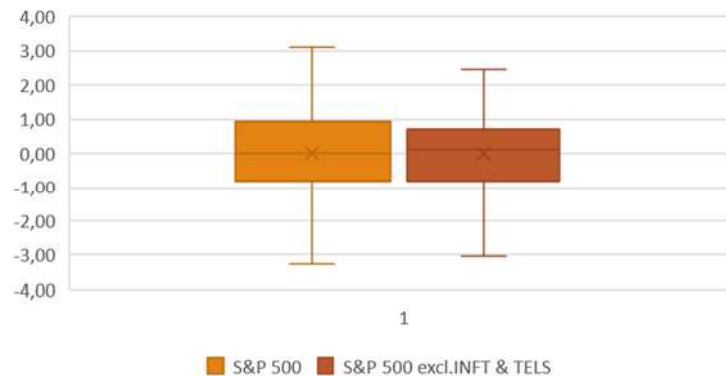


	S&P 500	S&P 500 excl.INFT & TELS
Mean	0,02	-0,02
Median	0,08	0,06

Source: Author’s own according to S&P data

The boxplot chart for the pandemic period shows a similar result as the distribution chart. The slightly higher median confirms the higher performance for the S&P 500 during the pandemic than for the S&P 500 ex information & technology & communication.

Figure no. 7: S&P 500 vs. S&P 500 excl. INFT & TELS from January to July 2022



	S&P 500	S&P 500 excl.INFT & TELS
Mean	0,01	-0,01
Median	0,00	0,11

Source: Author’s own according to S&P data

The boxplot chart for the Fed regime shift period shows a median for the S&P 500 ex information & technology & communication which confirms a higher performance than for the S&P 500. The results of the distribution data raise H2 if there is a high correlation

between U.S. interest rates and the performance of S&P 500 and S&P 500 ex information & technology & communication services.

2.3 Regression and Correlation Analysis

H2 will be answered with the help of a regression analysis and Pearson correlation for the index and Fed interest rate data. Data points and periods are the same as for the distribution and boxplot analysis. In the first step, a simple regression analysis for the pandemic observation is conducted with 505 data points.

Table no. 4: S&P 500 & S&P 500 excl. INFT & TELS vs. U.S. interest rates from 2020 to 2021

S&P 500			S&P 500 excl. Tech		
SUMMARY OUTPUT			SUMMARY OUTPUT		
<i>Regression Statistics</i>			<i>Regression Statistics</i>		
Multiple R	0,05		Multiple R	0,05	
R Square	0,00		R Square	0,00	
Adjusted R Square	0,00		Adjusted R Square	0,00	
Standard Error	1,11		Standard Error	1,05	
Observations	505,000		Observations	505,00	
<i>Coefficients</i>			<i>Coefficients</i>		
<i>Standard Error</i>			<i>Standard Error</i>		
Intercept	0,048662318	0,055577355	Intercept	0,011918503	0,052443002
Interest Rate	-0,129687922	0,115930822	Interest Rate	-0,132339221	0,109392762

Source: Author’s own according to S&P data

The regression analysis shows that there is no linear correlation between U.S. interest rates and the performance of S&P 500 and S&P 500 ex information & technology & communication services from 2020 to 2021.

In the second step a simple regression analysis for the Fed regime shift period is conducted with 144 data points.

Table no. 5: S&P 500 & S&P 500 excl. INFT & TELS vs. U.S. interest rates from Jan to July 2022

S&P 500 SUMMARY OUTPUT			S&P 500 excl. Tech SUMMARY OUTPUT		
<i>Regression Statistics</i>			<i>Regression Statistics</i>		
Multiple R	0,15		Multiple R	0,15	
R Square	0,02		R Square	0,02	
Adjusted R Square	0,02		Adjusted R Square	0,02	
Standard Error	0,01		Standard Error	0,01	
Observations	144,00		Observations	144,00	
	<i>Coefficients</i>	<i>Standard Error</i>		<i>Coefficients</i>	<i>Standard Error</i>
Intercept	-0,002021485	0,001513199	Intercept	-0,001809495	0,001342922
Interest Rate	0,003280514	0,001774465	Interest Rate	0,00287801	0,001574789

Source: Author's own according to S&P data

The result shows that there is a low linear correlation between U.S. interest rates and the performance of S&P 500 and S&P 500 ex information & technology & communication services in 2022. In the next step, Pearson correlation analysis for the pandemic observation is conducted with 505 data points.

Table no. 6: S&P 500 & S&P 500 excl. INFT & TELS vs. U.S. interest rates from 2020 to 2021

Pearson Correlation	S&P 500	S&P 500 excl. Tech
r	-0,049817	-0,053862
N	505	505
T	-1,118666	-1,209762
DF	503	503
p	0,263816	0,226938

Source: Author's own according to S&P data

The Pearson correlation shows for both indices values of 0 and indicates no correlation between U.S. interest rates and the performance of S&P 500 and S&P 500 ex information & technology & communication services from 2020 to 2021. The p-values for both analyses indicate no significance for the correlation values.

In the second step a Pearson correlation analysis for the Fed regime shift period is conducted with 144 data points.

Table no. 7: S&P 500 & S&P 500 excl. INFT & TELS vs. U.S. interest rates from Jan to July 2022

Pearson Correlation		
	S&P 500	S&P 500 excl. Tech
r	0,153308	0,151592
N	144	144
T	1,848734	1,827553
DF	142	142
p	0,066576	0,068209

Source: Author's own according to S&P data

The findings show that there is no correlation between U.S. interest rates and the performance of S&P 500 and S&P 500 ex information & technology & communication services in 2022. The p-values for both analyses indicate significance for the correlation values.

Therefore, it can be determined, that is no mean reversion process for the S&P 500 technology sector with the regime shift of the Fed after the pandemic

Conclusion

This paper shows the different sensitivity of S&P 500 sectors during the Covid19 pandemic from 2020 to 2021 and after the Fed regime shift in 2022. The technology sector contributed significantly to the positive performance in the low interest rate environment and led the negative contribution after raising interest rates beginning of 2022.

The main reason for this development is rising U.S. government bond rates and the effects of the discounted cash flow method on the highly capitalized U.S. technology sector. Interestingly, the performance of the S&P 500 is in fact higher during the pandemic and lower after the central bank regime shift in 2022 than for the S&P 500 ex information & technology & communication. But the regression analysis of this paper shows that that there is no linear correlation between U.S. interest rates and the performance of the technology sector and proves that that there is no mean reversion process until July 2022.

Therefore, the aim of this paper results in the important conclusion that the hypothesis that the higher the interests at the end of the pandemic the higher the mean reversion process for the highly capitalized S&P 500 technology sector is wrong.

Since traditional companies, such as utilities or consumer goods and banks, are less affected by the mechanism of discounted cash flow this paper expresses further dedicated research on other sectors of the S&P 500.

The paper also recommends conducting research on the Euro Stoxx 600 sectors to analyze a potential correlation with the EZB interest rates the performance in comparison to the Fed impact.

Literature

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