

The Increase of Federal Funds Rate and the QQQ ETF Illiquidity

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Abstract: The modification of the Federal funds rate is crucial for regulating inflation, fostering employment opportunities, and ensuring sustained economic growth. The QQQ ETF is an exchange-traded fund designed to track the NASDAQ 100 index— an important stock price barometer in the United States that reflects technology companies' development. As the United States Federal Reserve continues to change the interest rates during this period, whether the QQQ ETF illiquidity of the world's major technology companies will be affected has become increasingly important. This paper selects one important period of the Fed's interest rate increase in succession. It analyzes the trend of the QQQ ETF illiquidity aiming to explore the different impacts of the decrease in the Federal funds rate on the QQQ ETF illiquidity. The research indicated that the elevation of the Federal funds rate substantially impacts the illiquidity of the QQQ ETF. The research results are expected to help investors predict changes in the QQQ ETF during the same period in the future to make more reasonable responses.

Keywords: Federal Funds Rate, Decrease, QQQ ETF, Illiquidity

1. Introduction

As “a cornerstone of U.S. monetary policy and a key driver of economic activity” [1], The Federal funds rate plays a vital role in the U.S. and the world. It pertains to the designated target interest rate corridor established by the Federal Open Market Committee (FOMC).

Current empirical analysis shows that the Federal Reserve has redesigned its monetary policy tools to increase transparency and control over the Federal funds rate. The downward trend in reserve requirements has increased interest rate volatility in the United States, while plans to pay interest on reserves are expected to significantly reduce the volatility of the Federal funds rate [2]. An additional illustration is the Autoregressive Conditional Hazard (ACH) model, which offers a robust framework for forecasting fluctuations in the Federal funds target rate by estimating the timing of discrete events (such as adjustments in the target rate) and calibrating them using maximum likelihood estimation techniques [3]. Since 2022, the continuous rise of the Federal funds rate has raised attention, particularly in corporate finance. Another aspect is to find the relationship between the hike in the federal funds rate and credit, capital, leverage and insolvency risk [4].

The Federal funds rate is arguably one of the most critical interest rates in the United States, influencing economic conditions and serving a pivotal role in managing inflation and fostering employment. The Federal Reserve can execute monetary policy by establishing a target for the effective Federal funds rate [5]. As part of its monetary policy, The FOMC set the target Federal

funds rate range. The committee uses various tools to push the effective Federal funds rate into that target range. If FOMC decides to increase this rate, it aims to slow down the economy or combat inflation. This condition could decrease investing activities and encourage saving, and vice versa [1]. Besides, The increase in money market spreads during the financial crisis was partly due to increased volatility in the Federal funds market [6]. Other literature which analyze the Federal Funds Rate mainly considered their implementation or impact, studied the future trend of the Federal funds rate, found the method and law of the Fed's interest rate hike or cut, and put forward corresponding measures.

Exchange-traded funds (ETFs) are investment vehicles that function as mutual funds, comprising a diversified collection of various equities or fixed-income securities, which are publicly listed on stock exchanges and traded as financial instruments.[7] QQQ ETF is an exchange-traded fund that tracks the NASDAQ-100 index and is managed by American ETF giant Invesco. 100% of QQQ's portfolio comprises constituent stocks in the NASDAQ-100 index. By investing in the QQQ ETF, investors can diversify their investments into 100 companies in the NASDAQ-100 index and reduce the risk of a single stock. Following the launch of the QQQ ETF, research indicated that the constituent securities underwent a reduction in both time-weighted absolute quoted spreads and time-weighted relative quoted spreads [8]. A multitude of studies has explored the influence of exchange-traded funds (ETFs) across different segments of the financial ecosystem. Efe analyzed the degree to which variations in bond liquidity demonstrate correlated movements among securities characterized by substantial institutional ownership within the same classification. This investigation uncovered the liquidity commonality inherent in the corporate bond market and substantiated the significant impact of ETF outflows and the arbitrage processes that influence the liquidity commonality of corporate bonds [9].

In general, the above studies focused on analyzing the Fed's control over the Federal funds rate and explaining the nature of ETF and the effect of QQQ ETF in the security market. Although the existing literature has extensively studied ETF liquidity and its influencing factors, some research gaps still exist. Firstly, most studies focus on the direct impact of ETFs on the liquidity of constituent stocks and less on the mechanism by which macroeconomic variables (such as the Federal funds rate) affect ETF liquidity. Secondly, for the specific target of QQQ ETF, the existing literature mostly focuses on its constituent stock structure and trading activity. However, it lacks an in-depth analysis of the relationship between its liquidity and the Federal funds rate. Besides, illiquidity is still a variable which needs to be further studied.

The unique significance of this study is to fill this gap and explore the impact of the US Federal funds rate on the liquidity of QQQ ETFs through empirical analysis. This not only helps to understand how macroeconomic policies affect the microstructure of financial markets through the interest rate transmission mechanism, but also provides investors with forward-looking insights into the impact of interest rate changes on ETF liquidity. In addition, the study's results will provide a reference for policymakers to better assess the potential impact of interest rate policy on market liquidity and optimize the implementation of monetary policy.

This paper makes the following arrangement: first, to analyze the background of current settings, the Federal funds rate, and the crucial creatures of QQQ ETF. This paper will describe the statistics and research methods, then the results can be drawn. Finally, the conclusion will be summarized.

2. Background and theoretical framework

2.1. Federal funds rate

Currently, the inflation rate in the United States remains elevated. It was predicted that upside risks to the inflation outlook had increased. Since September 2024, the Federal funds rate has been cut

three times in a row [10]. Raising the federal funds rate is widely regarded as a potent strategy for addressing inflationary pressures. In light of this context, the study opts to lower the federal funds rate for its analysis.

2.2. QQQ ETF, NASDAQ-100 and others

Dow Jones Industrial Average index (also DJIA index) is a blue-chip stock benchmark index of the United States, it is also one of the most watched stock indices in the world. Unlike the NASDAQ-100, it is weighted by share price rather than market capitalization, so the Dow Jones Industrial Average is a good indication of a company's strength [11].

Standard & Poor's 500 index (also S&P 500 index), proposed in 1957, is a market capitalization-weighted index (the same as the NASDAQ-100 index) of 500 major public companies in the United States. The S&P 500 is regarded as one of the most reliable indicators of large-cap U.S. equities and the broader stock market due to its comprehensive representation and diversity [12].

The QQQ exchange-traded fund (ETF) monitors the performance of the NASDAQ-100 index. QQQ ETF is chosen mainly because of the NASDAQ-100's nature. Both the NASDAQ-100 index and the S&P 500 index are market capitalization-weighted, meaning that companies with larger market capitalizations have more influence on the index. The scope of the company is relatively extensive; the Dow Jones Industry Average index is a price-weighted index, which means that companies with high stock prices have a more significant impact on the index, and the scope of the company is narrower by contrast. In addition, the NASDAQ-100 index, compared to the S&P index, contains many technology stocks and has a higher weight in the information technology sector. It means the liquidity is clearly higher. This paper also focuses on investors who are optimistic about the future of technology. Besides, QQQ ETF also has the characteristics of large trading volume, small bid-ask spread, and strong liquidity of constituent stocks. The overall liquidity, trading activity, and frequency of transactions for component securities experience an uptick following the launch of the QQQ ETF [8]. Zhu et al. verified that the efficiency level of the QQQ fluctuates in a relatively small interval and is highly efficient [13]. In total, QQQ ETF is a great choice.

2.3. Hypothesis

The Federal funds rate is anticipated to influence the illiquidity of the QQQ ETF.

H₁: The increase of the Federal funds rate has an effect for the increase of the QQQ ETF liquidity.

3. Statistics, methodology and analysis

3.1. Variables

In this paper, the illiquidity is calculated by Amihud's method [14].

$$ILLIQ = R/TV \quad (1)$$

ILLIQ is the illiquidity of QQQ ETF stocks, R is the daily absolute return and TV is daily trading return. This paper takes into account that $\ln ILLIQ = \ln R - \ln TV$, hence using $\ln ILLIQ$ as dependent variable.

The rise in the Federal funds rate serves as the independent variable. It's stipulated as a variable FFR. In addition, two macro variables, the American Unemployment rate (UR) and the inflation rate (IR), are added as control variables at the corresponding time period.

3.2. Statistics and methodology

The numerical change in the federal funds rate for equities between January 2016 and December 2018 can be obtained [15]. The data for these three years were selected because the federal funds rate increased relatively frequently during these three years and there was no reduction in the federal funds rate. Unemployment and inflation rates are significant, contributing to the empirical process in regression analysis [16, 17]. The inflation condition is calculated using the growth rate of the Consumer Price Index for All Urban Consumers (CPI) in the corresponding month. IR is calculated by taking the first-order difference for CPI. By contrast, In 2008, there was a global financial crisis; There was a relatively long period from 2009 to 2015 during which there were no adjustments to the federal funds rate; The emergence of the coronavirus epidemic after 2020 has once again had a surprising impact on macroeconomic data. These three years are more appropriate.

QQQ ETF monthly stock returns and trading volume for these three years are also available [18,19]. Among them, the TV uses the monthly average trading volume. Days on which the QQQ ETF was not traded are excluded from the data.

The variables and summary statistics are as follows:

Table 1: Variables and summary statistics

Variable	Obs	Mean	Std. dev.	Min	Max
R	36	134.1339	24.99729	97.47	178.45
TV	36	3.71e+07	1.71e+07	1.62e+07	8.23e+07
lnR	36	4.881693	0.1886428	4.579545	5.184309
lnTV	36	17.33225	0.4407364	16.60203	18.22559
lnILLIQ	36	-12.45056	0.4243759	-13.28008	-11.82101
FFR	36	1.201389	0.637572	0.5	2.5
UR	36	4.375	0.4292019	3.7	5.1
CPI	37	245.6019	4.909575	237.336	252.772
IR	36	0.1692802	0.1587801	-0.1329675	0.510639

All variables have a sample size of 35 except for lnILLIQ. The mean of lnILLIQ is -12.45056, the mean of FFR is 1.201389, the mean of UR is 4,375, and the mean of IR is 0.1692802.

The variables are all in the time series. Therefore, the AR model is used to estimate the short-term and long-term effects of the federal funds rate on the illiquidity of QQQ ETF. The general-to-specific sequential t tute suggests the model:

$$\ln \text{ILLIQ}_t = \beta_0 + \beta_1 \ln \text{ILLIQ}_{t-1} + \gamma_1 \text{FFR}_t + \gamma_2 \text{UR}_t + \gamma_3 \text{IR}_t + \varepsilon_t \quad (2)$$

t represents the time in months, from 1 to 36.

4. Results

The regression results verified the speculation.

Table 2: Regression results

	(1)
	regression
ln ILLIQ _{t-1}	0.495***
	(0.004)
FFR _t	-0.591**

Table 2: (continued).

	(0.050)
UR _t	-0.745
	(0.101)
IR _t	0.236
	(0.481)
cons	-2.341
	(0.392)
N	35
R2	0.405

p-values in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01

The regression results show that the illiquidity of the previous period of QQQ ETF has a very significant positive correlation with the illiquidity of the next period. The Federal funds rate also has a significant negative impact on illiquidity over the same period (p-value below 0.05), this suggests that the Fed's interest rate hike can reduce the illiquidity of QQQ ETFs, i.e., increase liquidity. This manuscript elucidates that the Federal Reserve's interest rate increases typically elevate the yields on dollar-denominated assets, thereby drawing capital back to the United States and enhancing the appeal of these assets. Consequently, this may result in a portion of the capital migrating into the U.S. equity market from alternative asset classes, subsequently boosting the trading volume and liquidity of the QQQ ETF. Because QQQ ETF is an ETF that tracks the Nasdaq 100 index, most of its constituent stocks are technology giants, which have high market attention and attractiveness, and capital inflows will drive their trading volume to rise. In addition, if investors generally believe that rising interest rates will drive economic growth and corporate earnings, they may increase their exposure to the stock market, including the QQQ ETF, thereby enhancing their liquidity. While the unemployment and inflation rates do not exert a substantial influence on the illiquidity of the QQQ ETF, the estimators indicate that an increase in inflation correlates with heightened illiquidity of QQQ ETFs; conversely, the unemployment rate appears to have an inverse effect. Additionally, this is consistent with the Phillips curve's theoretical presumptions.

Based on the AR model, we can also calculate the long-term effect of the increase in the federal funds rate on the illiquidity of the QQQ ETF. This result is -0.8678. This proves that the increase in the federal funds rate also has a negative long-term effect on QQQ ETFs.

5. Conclusion

Based on the above analysis, this paper argues that the decrease in the Federal funds rate does affect the QQQ ETF's illiquidity. The study confirms that the increase in the Federal funds rate significantly reduces the illiquidity of the QQQ ETF, thereby enhancing its liquidity. Rising interest rates draw capital back to the United States, enhancing the appeal of dollar-denominated assets and stimulating trading activity in the QQQ ETF. This effect is particularly pronounced due to the high market attention and attractiveness of the technology giants that constitute the NASDAQ-100 index. This research addresses the gap in understanding how macroeconomic variables, specifically the Federal funds rate, impact ETF illiquidity. It provides a deeper analysis of the relationship between interest rates and the illiquidity of the QQQ ETF. The findings offer valuable insights for investors, helping them anticipate changes in ETF illiquidity and liquidity during periods of interest rate adjustments. This can guide more informed investment decisions. The study provides a reference for policymakers

to better assess the impact of interest rate policies on market liquidity, contributing to the optimization of monetary policy implementation.

The study focuses on a specific period (2016-2018) when the Federal funds rate increased relatively frequently. Future research could explore other periods or economic conditions to validate the findings. While unemployment and inflation rates were included as control variables, other macroeconomic or market-specific variables could be considered in future studies to provide a more comprehensive analysis. The use of the AR model provides insights into short-term and long-term effects, but alternative econometric models could be explored to further refine the understanding of the relationship between interest rates and ETF liquidity.

The study underscores the significance of the Federal funds rate in shaping the liquidity of the QQQ ETF, illustrating the interrelation between macroeconomic policies and the microstructure of financial markets. Subsequent research could examine the effects of alternative monetary policy instruments or delve into the liquidity dynamics of additional ETFs to further expand upon the insights derived from this investigation.

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