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The Comparison and Analysis of Exchange Traded Funds (ETFs) Return Rates

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Abstract

Based on the trading data of A-share listed companies held by ETFs and the shareholding data of exchange-traded funds during 2011-2022 in China stocks markets, this paper uses the dynamic panel differential GMM model to study the shareholding ratio of exchange-traded funds and the impact of its changes on the liquidity of the underlying stocks. First, all the samples were regression and empirical results were analyzed. Then, the main board of Shanghai and Shenzhen, small and medium-sized board and growth enterprise board stocks were respectively regression to draw conclusions, and the robustness of the above research was tested. In the end, two main conclusions are drawn from the above research:
(1) There is a significant positive correlation between the shareholding ratio of ETFs and stock liquidity, that is, the higher the shareholding ratio of ETFs, the higher stock liquidity.
(2) The positive change of ETFs shareholding ratio will significantly increase the liquidity of the underlying listed companies' stocks.

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1. Introduction

Exchange-traded funds, also known as exchange traded funds, are open-ended funds that can be subscribed and redeemed in the primary market and traded like stocks in the secondary market, that is, they can be listed on an exchange and traded with variable fund shares (Fremault, 1991). Due to the above characteristics and the unique advantages compared with other financial products, ETFs is one of the many innovative financial products growing very fast. In recent decades, ETFs has developed rapidly in the world. Developed countries took the lead in launching exchange traded funds, and then developed rapidly in developed stock markets (Kumar & Seppi, 1994). However, China's first exchange traded fund, Shanghai 50ETFs, was listed on the Shanghai Stock Exchange in 2005, marking the birth of China's exchange traded fund market. After that, the number and scale of Chinese exchange traded funds have improved rapidly. In the 14 years since the launch of exchange traded funds in China, ETFs trading has continued to develop and become increasingly active. From one ETFs in 2005 to 198 ETFs in 2018, the net asset value of ETFs increased from 6.6 billion yuan to 577.3 billion yuan.

It can be seen that 2005-2010 was the initial development stage of exchange-traded funds after the launch of ETFs products in China, during which the development was relatively slow. In 2010, with the relative maturity of ETFs product design and investment strategy, since 2010, ETFs has shown outstanding advantages over other products: Exchange-traded funds can significantly promote trading activity in the market, and increase investors' investment channels, so that investors have more choices. With the continuous increase of domestic index types and index quality, as well as the continuous launch of corresponding ETFs products, more opportunities will be brought to the advance of ETFs by constantly subdividing the target market. In addition, margin financing and the launch of the corresponding futures products will greatly promote the rapid development of the ETFs market. In May 2012, China launched the first cross-market index fund, Shanghai and Shenzhen 300ETFs, which were a milestone in the design and development of the Chinese exchange traded fund market and marked the gradual maturation of the Chinese exchange traded fund market. Especially in the years that followed, the number of types of ETFs and the size of their assets grew rapidly, as did the proliferation of ETFs-related derivatives. These not only provide better financial management and investment methods for individual investors in the securities market, but also provide better ways for institutional investors to choose when establishing investment portfolios, so as to maximize the benefits and minimize the risks of assets (Holden, 1995).

2. Industry ETFs yield rate calculation

2.1 ETFs Selection

Following the instructions provided, a list of five random numbers is obtained. The ETFs are selected from the ETFs AU.xlsx dataset. The selected entries are shown as Table 1.

Table 1. ETFs Selected by Random Number Generator

Number	Portfolio	Name
125	IVV	iShares S&P 500 ETFs
139	MDZ-NZ	Smartshares NZ Mid Cap
153	MVR	VanEck Vectors Australian Resources ETFs
171	POU	BetaShares British Pound ETFs
178	QPON	Betashares Aus Bank Sr Flting Rt Bd ETFs

1) iShares S&P 500 ETFs

According to the introduction on the official website of iShares,IVV holdsan exposure to the top 500 large and established U.S.companies and provides investors access to these companies with cost and tax advantage.The investment objective is that it seeks to track the investment results of an index composed of large capitalization U.S equities, S&P 500 Index.

2) Smartshares NZ Mid Cap

According to the introduction on the official website of Smartshares MDZ-NZinvests in financial products that are listed on NZX Main Board. The investment objective is to track the return of the S&P/NZX Mid Cap Index.

3) VanEck Vectors Australian Resources ETFs

According to the introduction on the official website ofVanEck. MVR gives investors exposure to a diversified portfolio of ASX-listed securities.The investment objective of MVR is to track the performance of MvIS Australia Resources Index. which includes the largest and most liquid ASX-listed companies that generate at least 50% revenues or assets from the Australian resources sector

4) BetaShares British Pound ETFs

POUisan ETFs which provides an exposure on the British pound with low cost and sufficient portfolio diversification. The investment objective is to track the performance of the British pound against the Australian dollar.

5) Betashares Aus Bank Sr Fltng Rt Bd ETFs

QPON is an ETFs which provides an exposure on eligible bonds. Investors can expect defensive characteristics during market declines and a high level of capital stability. The fund pays income monthly which relates to the current interest rate. The investment objective is to track the performance of an index that measures the performance of a portfolio of some of the largest and most liquid senior floating rate bonds issued by Australian banks.

2.2 Benchmark

1) **iShares S&P 500 ETFs:** Based on the characteristic of the ETFs, it is reasonable for us to consider the index it tracks as its benchmark. Which is the S&P 500 index.
2) **Smartshares NZ Mid Cap:** As an ETFs who's tracking index is specified clearly we consider its tracking index as benchmark. The benchmark is NZX Mid Cap Index.
3) **VanEckVecors Australian Resources ETE:** We consider the index that is tracked by the ETFs as its benchmark. The benchmark is MVIS Australia Resources Index.
4) **BetaShares British Pound ETE:** Different from the others, PoU track the performance of the British pound against Australian dollar rather than specific index.ltis reasonable to consider the exchange rate of British pound against Australia Dollar, GBPAUD, as its benchmark.
5) **BetaShares Aus Bank Sr Fltng Rt Bd ETFs:** We consider the index that is tracked by the ETFs as its benchmark. The benchmark is Solactive Australian Bank Senior Floating Rate Bond Index.

2.3 Monthly Return

The raw data of other ETFs including the Russell 3000 are obtained from Morningstar database and Yahoo Finance. The period between 2018 to 2020, no ETFs listed can outperform the performance of market consistently. lVV has the highest monthly return among the ETFs, which is 1.02%. Other equity ETFs, MDZ-NZ and MVR have similar but lower returns. 0.79% and 0.77%. ETFs invest in foreign currency and bonds have much smaller returns. The return of POU and QPON are 0.05% and 0.06% respectively.

Certainly, ETFs that invest in different categories also have variable volatility. MVR indicates a more violent fluctuation than Russel 3000 and corresponding. A higher risk. Other equity ETFs IVV and MDZ-NZ show lower volatility than the market average level. Besides, POU and QPON show much smaller volatility than equity funds as a result of their investment targets, currency and bonds most ETEs have the positive correlation with Russell 3000. That means they have similar trends.

2.4 Risk-free Rate

An appropriate proxy for a risk-free asset can be treasury bill of specific horizon. Since the five ETFs are evaluated in a time horizon of three years it is reasonable to use medium term maturity treasury bond rate. The data is obtained from investing dataset. Since we mainly focus on the performance of the ETFs from 2018 to 2020. The 3-year treasury constant maturity rates from January 1st, 2018 to December 2020 are downloaded. The average maturity rate is considered as risk-free rate. The monthly risk-free rate is 0.0993%.

2.5 Risk-adjusted performance

A primary summary of the ratios is provided in the following table 2.

Table 2. Primary Summary of the Ratios Calculated

ETFs	IVV	MDZ-NZ	MVR	POU	QPON
Sharpe Ratio	0.229834	0.158308	0.100998	-0.022790	-0.070185
Treynor Measure	0.016932	0.012306	0.007825	0.003085	-0.006079
Jensen's Alpha	0.000734	0.006840	0.002764	0.000024	-0.000242
Information Ratio	0.137467	0.046639	-0.305152	-0.064694	-2.069998
MRAR	8.5057%	4.4670%	0.0071%	-1.3142%	-0.5485%

Notes: For the Calculation: Functions provided bvExce ike slatistical description and reoression are applied in the calculation. While calculating Jensen's Alpha, the SMB and HMLdata is obtained from the website of Fama and French. Risk-free rate and excess market return are obtained in the previous question. Whie calculating the information ratio, the weekly return of the benchmarks obtained from yahoo finance and official website are used. The sources of external data used are specified in the reference.

2.6 Discussion and Explanation

Here, we organize our discussion in the order of metrics.

2.6.1 Sharpe Ratio

Sharpe ratio is a measure of how much excess return can be earned while bearing a specific amount of risk (Boehmer, 2003). A higher Sharpe ratio is desirable Among the ETFs selected, IVV, MDZ-NZ and MVR have positive Sharpe ratios. IVV has the highest Sharpe ratio, which indicates the portfolio is expected to gain a higher excess return while maintaining an identical exposure of the risk. It is supposed to note that POU and QPON have negative Sharpe ratios. Considering the definition of Sharpe ratio, this is the consequence of their negative excess returns. Negative Sharpe ratios make no sense.t is reasonable to focus on the performance of three equity ETFs, whose Sharpe ratios are positive.

2.6.2 Treynor Measure

Treynor measure has a similar usage at Sharpe ratio. Their key difference is the consideration of unsystematic risk. Treynor measure considers the ETFs as fully-diversified portfolios while Sharpe ratio does not. Consequently, Treynor measure indicates how much excess return can be earned while bearing a specific amount of systematic risk (Kurov & Lasser, 2002). Which is measured by beta. Similary, lv. MDZ-NZ and MR has positive and decreasing Treynor measures. which indicates lvv has the best performance among the ETFs. Still, QPON has a negative Treynor measure because of negative excess return. It confusing that POU has a positive one. The reason is that the Beta of POU is negative, which means its excess return has a negative correlation with that of the market. That is acceptable because POU is an ETFs that invests in foreign currency. Its beta makes no sense.

2.6.3 Jensen's Alpha

Jensen's alpha is a measure to determine how much excess return of a portfolio is realized. The three equity ETFs have positive Alphas. Among which MDZ-NZ has the highest Jensen's Alpha, 0.684%. That means it beats the market by 0.684% per month. The result of POU. 0.0024% still makes no sense. QPON has a negative Alpha, which means it can not out perform the market, which confirms our previous findings (Hasbrouck, 2003).

1) Information Ratio

Information ratio considers if a portfolio can outperform a specific index. Here, we consider the relationship between the ETFs and the benchmark they track. Only IVV and MDZ-NZ realized positive information ratio in the calculation, indicates that they even outperform their benchmarks. The other three ETFs with negative information ratio have a dissatisfying tracking performance.

2) Morningstar Risk-Adjusted Rating (MRAR)

MRAR is a measure of return which gives a volatility a certain amount of penalty. A higher MRAR indicates a higher return after risk adjustment. The three equity have positive MRARs and IVV has the highest one. POU and QPON still have negative MRARs as a consequence low return and high risk.

Then, we consider the market timing ability of the ETFs managers by running a regression. The equation is Here Bis the coefficient of the influence of the market excess return D(market,risk-free>0)is a dummy variable to identity that if the market is going wellB2 is the coefficient that indicates whether an ETF manager has the ability of market timing. Regressions are conducted in Excel file. The results of β2 are provided as the table 3.

Table 3. Regression Results about Market Timing Ability

ETFs	IVV	MDZ-NZ	MVR	POU	QPON
Coefficients of β2	-0.436884	-0.028211	0.0717157	-0.3620352	-0.1849739
p-value	0.086958	O.779681	0.3007862	0.0965495	0.0692397
Significance Level	10%	NO	NO	10%	10%

The results are not really optimistic. For IVV, MDZ-NZ, POU and QPON.
the coefficients of β2 are negative, which make no sense. MVR is the only ETFs whose coefficient of β2 is positive. However, its p-value is 0.30, which means it is not likely be significant in 10% significance eve. Based on these results, there is no evidence that can prove the market timing ability of the ETFs. This may because that the main objective for ETFs managers is to track and stick to the benchmark, rather than conducting the market timing operation.

3. Empirical analysis of Exchange traded fund yield

3.1 Definition of variables and Data analysis

3.1.1 Definition of variables

The illiquidity index of T-period is abbreviated as ($ILLIQ_t$). The illiquidity index of period t-1 is abbreviated as ($ILLIQ_{t-1}$). The shareholding ratio of T-period ETFs is abbreviated as ($Weight_t$). The increment of the total shareholding ratio of between period t and period t-1 exchange trading is abbreviated as (dWeicht).

The period t stock volatility is abbreviated as (Vol_t). The logarithm of the stock price is abbreviated as (LnP). Price-to-book ratio is abbreviated as (PB). The logarithm of market capitalization of listed companies is abbreviated as (LnSize), The proportion of outstanding shares is abbreviated as (Outshare). The market illiquidity measures abbreviated as (MILLIQ).

3.1.2 Descriptive statistics

As shown in Table 4, from 2011 to 2020, a total of 721 listed companies have obtained 5,768 observed values, among which the observed value of shareholding ratio change is 5,047 and the maximum value of shareholding ratio change is 0.039317, indicating that the shareholding ratio of some exchange-traded funds has changed greatly, reaching 4%. Moreover, the standard deviation of shareholding ratio change is much larger than the average, indicating that the shareholding ratio change of different companies has a large difference. The ILLIQ mean value of liquidity index is slightly less than the standard deviation, indicating that there is a certain gap in stock liquidity among different listed companies (Yu, 2005). The average value of Vol of stock volatility is slightly less than the standard deviation, indicating that there is a certain gap in stock volatility among different listed companies. The largest indicator of the proportion of tradable shares is 1. It indicates that all shares of some companies are tradable. This can be shown as table 4.

Table 4: Descriptive statistical results

Variable name	Average value	Standard deviation	Minimum value	Maximum value	Observed value
ILLIQ	0.0271665	0.0305548	0.000296	0.411491	5768
Weight	0.0045749	0.0052556	3.24e-06	0.0397659	5768
dWeight	0.000575	0.0039317	-0.0248158	0.034058	5047
Vol	0.0263323	0.0089762	0.007146	0.069529	5768
LnP	2.410422	0.7205728	0.3364722	6.547488	5768
PB	3. 175577	2.458454	0.499	37.6229	5768
Size	23.31719	1.062084	20.90725	28.19085	5768
MILLIQ	0.0580157	0.0251963	0.02282	0.106628	5768
Outshare	0.8656241	0.1951658	0.0506086	1	5768

3.1.3 Unit root test

According to the data structure and needs of this paper, unit root test is conducted on eight variables by using HT test and IPS test, and the test results are shown in Table 5. According to the statistics and P-values corresponding to HT test and IPS test, the null hypothesis of the existence of unit root of the above variables should be rejected, so all variables in the table 5 are stable.

Table 5: Unit root test result

Variable name	HT test	IPS test
IL L IQ	0.2135*** (0.0000)	-6.8161*** (0.0000)
Weight	0.526 8*** (0.000)	15.8676*** (0.000)
dWeight	-0.2144*** (0.0000)	-17.2815*** (0.0000)
Vol	0.0890*** (0.0000)	-14.5521*** (0.0000)
LnP	0.4777*** (0.0000)	-4.1054*** (0.0000)
PB	0.3263*** (0.0000)	-9.7786*** (0.0000)
Size	0.5047*** (0.0000)	-3.1944*** (0.0007)
MILLIQ	0.4193*** (0.0000)	-15.2321*** (0.0000)
Outshare	0.3367*** (0.000)	-5.3786*** (0.000)

3.2 Empirical Analysis

3.2.1 Impact of ETFs holdings on stock liquidity

According to the results of unit root test, all variables are stable, and considering the endogeneity of the model, this section will directly adopt the dynamic panel data regression model to analyze the impact of ETE shareholding ratio on the liquidity of constituent stocks. The general form of the model involved in this time is in equation (1).

$$ILLIQ_{it}=\alpha_1 ILLIQ_{it-1}+\alpha_2 Weight_{it-1}+\alpha_3 Risk_{it}+\alpha_4 LnP+\alpha_5 PB+\alpha_6 LnSize +\alpha_7 Outshare+\alpha_8 MILLIQ+u_i+\varepsilon_i t \quad (1)$$

According to the above analysis, the specific form of model regression should be set as dynamic panel-differential GMM. In this paper, Stata 14.0 software is used to perform dynamic panel-differential GMM regression method for estimation. The specific estimated results are shown in Table 6.

Table 6: Difference-GMM regression results

Variable name	Coefficient	Standard deviation	t-statistic	Adjoint probability
$ILLIQ_{t-1}$	0.2410558***	0.0127569	18.90	0.000
$Weight_t$	-1.168617***	0.0774887	-15.08	0.000
Vol_t	0.3092361***	0.0258694	11.95	0.000
LnP_t	-0.0073344***	0.0014873	-4.93	0.000
PB_t	0.0006864**	0.0003066	2. 24	0.018
LnSize $_t$	-0.0017149***	0.0014751	-15.16	0.000
$MILLIQ_t$	-0.0042949***	0.003576	-4.20	0.000
$Outshare_t$	0.3174298***	0.0130684	24.29	0.000
-cons	0.6139547***	0.0308583	19.90	0.000

Note: ***, ** and * are significant at 1%, 5% and 10% respectively.

It can be seen from Table 6 that the P value of explanatory variables and all control variables except PB is less than 0.01, and all variables are significant at the 1% level, among which the P value of PB is 0.018, indicating that it is significant at the 5% level. First, the Weight of ETFs holdings is inversely proportional to illiquid indicator ILLIQ, that is, the higher the proportion of stocks held by exchange-traded funds, the smaller illiquid indicator ILLIO. According to the meaning represented by ILLIO index, the higher ILLIO index, the worse the liquidity of the corresponding stocks. The original hypothesis H1a cannot be rejected: there is a significant positive correlation between ETFs holdings and stock liquidity, that is, the higher the proportion of ETFs holdings, the higher the stock liquidity. Then, for the ILLIQ coefficients of the last period, they are all positive, which is significant at the level of 1%, indicating that the TLLTO index itself has a certain inertia. It is further verified that the TLLIO index of the previous period has a certain positive influence on the current period, so the dynamic panel model should be selected for regression. Secondly, the stock illiquidity index TLLIO is in direct proportion to the annual stock return volatility Vo1, which indicates that the greater the stock return volatility, or the higher the risk of the stock, the worse the stock liquidity. This may be because the greater the stock return volatility, the greater the expectation difference between the stock traders in the market and the future price of the stock. This will lead to a wider spread in the market between buyers and sellers of the stock. At the same time, the greater the volatility, the greater the uncertainty of both parties to the stock price in the future market, and the greater the adverse selection cost faced by investors, which weaken the desire of investors to trade in the market. In order to avoid losses with informed traders in the process of trading, resulting in a deep decline in the market, reduced liquidity. Thirdly, the index of stock illiquidity is inversely proportional to the size of the listed company, indicating that the larger the size of the listed company, the higher the liquidity of its stock. This may be because the larger the size of the company, the lower the degree of information asymmetry, and thus the lower the adverse selection cost for investors to participate

in the trading of the larger the size of the company, the higher the liquidity of the stock.

Finally, the stock illiquidity index TLLTO is inversely proportional to 0utshare, indicating that the higher the proportion of tradable shares of a company, the better the stock liquidity of a listed company (Hegde, 2004). This may be because of the higher the proportion of tradable shares, the lower the goal inconsistency between non-tradable shareholders and tradable shareholders, and thus the lower the degree of information asymmetry. The lower the cost of adverse selection, the higher the liquidity of the stock. Due to the short development history of Chinese stock market, there are some speculation phenomena in the market, the lower the proportion of tradable shares of the company market value is generally smaller, more prone to become the object of speculation by large investors, the lower the tradable shares are more conducive to the speculation of large investors, but lead to the assumption of higher liquidity of the company stock.

As a consistent estimation, the premise of effective differential GMM model is that the interference item e does not exist autocorrelation, and the difference of e has first-order autocorrelation, but the difference of e does not exist second-order autocorrelation (Richie, 2007). Therefore, to verify no autocorrelation exists. The Arellano-Bond sequence autocorrelation test can be used to verify the existence of first-order and second-order autocorrelation in the difference of e, which was previously assumed to be non-existent sequence autocorrelation. Since instrumental variables are used in the cent-gmm model, Sargan test is used to test whether instrumental variables are over identified. The original assumption is that all instrumental variables are valid. The results of Arellano & Bond test and Sargan test are shown in Table 7.

Table 7: Arellano & Bond test and Sargan test

	Arellano & Bond test			**Sargan test**
Order	z	Prob>z	chi2	Prob>chi2
1	-5.0882	0.0000	89.56	0.145
2	1.5828	0.1135		

According to the Arellano & Bond test result, the P-value of the first-order autocorrelation test result is 0.0000, which rejects the null hypothesis. Therefore, the first-order autocorrelation exists; the P-value of the second-order autocorrelation test result is 0.1135, which cannot reject the null hypothesis. Therefore, the second-order autocorrelation does not exist, so the differential GMM model can be used. According to Sargan test results, all instrumental variables are valid, so there is no overidentification of instrumental variables.

3.2.2 Influence of ETFs shareholding ratio change on stock liquidity

In order to test whether the increase of ETFs shareholding ratio precedes the increase of stock liquidity (De Winne, 2014), that is, whether the increase of ETFs shareholding ratio increases the liquidity of the stock, and considering the endogenous problem of the model, this section will directly use the dynamic panel data regression model for regression, and adopt the illiquidity index (ILLIO.) of t period as the explanatory variable. The general form of the model involved in this analysis is as following equation (2).

$$ILLIQ_{it}=\alpha_1 ILLIQ_{it-1}+\alpha_2 dWeight_{it-1}+\alpha_3 Risk_{it}+\alpha_4 LnP+\alpha_5 PB+\alpha_6 LnSize +\alpha_7 Outshare+\alpha_8 MILLIQ+u_i+\varepsilon_i t \quad (2)$$

According to the above analysis, the specific form of model regression should be set as dynamic panel-differential GMM. In this paper, Stata 14.0 software is used to carry out dynamic panel-differential GMM regression method for estimation, and the specific estimation results are shown in Table 8.

Table 8: Differential GMM regression results

Variable name	coefficient	Standard deviation	t-statistic	Adjoint probability
$ILLIQ_{t-1}$	0.1807808***	0.0136281	13.27	0.000
$dWeight_t$	-0.3452615***	0.0463041	-7.46	0.000
Vol_t	0.255575***	0.0319768	7.99	0.000
LnP_t	-0.0013369***	0.0014035	-3.86	0.000
PB_t	0.0003841**	0.0003398	2.14	0.000
LnSize $_t$	-0.0028903***	0.0013944	-7.87	0.000
$Outshare_t$	-0.0049875***	0.0042482	-4.17	0.000
$MILLIQ_t$	0.2375842***	0.0162639	14.61	0.000
-cons	0.3442997***	0.0278394	12.37	0.000

Note: ***, ** and * are significant at 1%, 5% and 10% respectively.

As can be seen from Table 8, the P value of explanatory variable and all control variables except PB is less than 0.01, and all variables are significant at 1% level, while the P value of PB variable is 0.030, significant at 5% level. First of all, the ILLIQ coefficients of the last period are all significant at the level of 1%, indicating that the ILLIQ index itself has a certain inertia. Then, there is an inverse relationship between dWeight of ETFs shareholding ratio and illiquidity index ILLIQ, that is, the more ETFs shareholding ratio increases in the previous period, the smaller illiquidity index ILLIO. The increment coefficient of shareholding ratio in the previous period is -0.3452615, indicating that after controlling other variables, For every 10% increase in ETFs holdings in the previous period, its ILLIO index will decrease by 0.0342615 in the current period. According to the meaning of the

TLLTO index, the higher the TLLTO index is, the worse the liquidity of the corresponding stocks will be. In other words, the above speculation is proved, and the original hypothesis H1a cannot be rejected: positive changes in the t-1 phase shareholding ratio of the exchange traded fund will significantly increase the T-phase liquidity of the underlying listed companies' stocks.

Secondly, consistent with the conclusion obtained in the previous section, stock illiquidity index ILLIQ is in direct proportion to annual stock return volatility Vol, which means that the greater the stock return volatility, or the higher the stock risk, the worse the stock liquidity. The index of stock illiquidity is inversely proportional to LnSize of the listed company, indicating that the larger the size of the listed company, the higher the stock liquidity. The illiquidity index ILLIQ has an inverse relationship with Outshare of outstanding shares of listed companies, indicating that the higher the proportion of outstanding shares, the better the stock liquidity of listed companies.

As mentioned above, in order to verify that the random interference item e does not exist autocorrelation, Arellano & Bond test is used to test whether the difference of e exists first-order and second-order autocorrelation. In order to test whether instrumental variables used in differential GMM regression exist over recognition, Sargan test is conducted, and the test results are shown in Table 9.

Table 9: Arellano & Bond test and Sargan test

	Arellano & Bond test			**Sargan test**
Order	z	Prob>z	chi2	Prob>chi2
1	-4.65	0.000	89.35	0.126
2	1.7642	0.1247		

According to the Arellano & Bond test result, the P-value of the first-order autocorrelation test result is 0.0000, which rejects the null hypothesis. Therefore, the first-order autocorrelation exists; the P-value of the second-order autocorrelation test result is 0.1247, which cannot reject the null hypothesis. Therefore, the second-order autocorrelation does not exist, so the differential GMM model can be used. According to Sargan test results, all instrumental variables are valid, so there is no overidentification of instrumental variables.

3.3 Sub-plate study

In this section, according to the different sectors of the underlying stocks, the main board, small and medium-sized board and GEM board of Shanghai and Shenzhen will be classified and studied (Saglam, 2019). Here, the main board samples of Shanghai and Shenzhen are the main board stocks of Shanghai and Shenzhen with small and medium-sized board samples excluded. Due to the different listing standards of stocks in different sectors, the companies in these sectors have many differences in profitability, company size, growth and so on. Then, according to the

number of the underlying stocks held by exchange-traded funds in different sectors, among which the main board of Shanghai and Shenzhen are 488 and 186 small and medium-sized boards, GEM at least 47; From the perspective of the time when it was held by exchange traded funds, it held the main board of Shanghai and Shenzhen at the earliest time, and then gradually held small and medium-sized board stocks and GEM stocks. As mentioned above, the above differences among the three sectors provide a realistic basis for this paper to study ETFs holdings by sector and the impact of shareholding changes on the underlying stocks.

3.3.1 Influence of ETFs shareholding ratio on stock liquidity

This section aims to explore the relationship between the shareholding ratio of exchange traded funds and the liquidity of the winning stocks in the three sectors. Using the illiquidity index (ILLIQ.) of period t as the explanatory variable, The explained variable is the increment of the shareholding ratio of T-period ETFs (Weight.), and the control variable is the illiquidity index of t-1 period (TLLTQ.), stock volatility of + period (Vo1), Logarithm of two share prices (LnP.), price-to-book ratio (PB.), logarithm of market value of listed companies (LnSize.), Outshare, market illiquidity index (MILLIQ.), The general model is represented in the equation (3).

$$ILLIQit=\alpha 1ILLIQit\text{-}1+\alpha 2Weightit\text{-}1+\alpha 3Riskit+\alpha 4LnP+\alpha 5PB+\alpha 6LnSize+\alpha 7Outshare+\alpha 8MILLIQ+ui+\varepsilon it \quad (3)$$

In the following, all Arellano & Bond test results show that random interference terms: there is no autocorrelation, and differential GMM model can be used; all Sargan test results show that instrumental variables in differential GMM regression are valid, and there is no over-recognition, which will not be repeated later. The differential GMM regression results by plate are shown in Table 10.

Table 10: Difference-GMM regression results by plate

Variable name	Shanghai and Shenzhen main board underlying stocks	Small and medium-sized board stock	Gem underlying stock
$ILLIQ_{t-1}$	0.2382789*** (17.54)	0.1962596*** (18.51)	0.179328*** (24.04)
$dWeight_t$	-1.276309*** (-15.40)	-2.248047*** (-11.04)	-1.167116** (-12.12)
Vol_t	0.3582183*** (13.49)	0.4845086*** (10.46)	0.2309579 *** (5.41)
LnP_t	-0.0061448*** (-3.73)	-0.0089552*** (-5.42)	-0.0133752*** (-7.86)
PB_t	0.0003746*** (2.69)	0.0002023*** (4.35)	0.0002407 (1.04)
LnSize $_t$	-0.0036819*** (-15.22)	-0.0025808*** (-22.60)	-0.0125663*** (-17..73)
$Outshare_t$	-0.0048235*** (-7.32)	-0.0100345*** (-7.16)	-0.0031925*** (-9.19)
$MILLIQ_t$	0.3104038*** (24.17)	0.614396*** (20.52)	0.7748306*** (30.29)
-cons	0.1207837*** (3.63)	0.8134475*** (25.64)	0.6422855 *** (21.85)
Number of underlying shares	488	186	47

Note: ***, ** and * are significant at 1%, 5% and 10% respectively.

As can be seen from Table 10, firstly, the coefficient of Weight in the three plates. The coefficients of main board, small and medium-sized board and growth enterprise board of Shanghai and Shenzhen are all negative, the main board and small and medium-sized board are significant at the level of 1%, and the growth enterprise board is significant at the level of 5%, which proves that the shareholding Weight of ETE fund is invertly-proportional to illiquidity index ILLIQ, that is, the higher the shareholding proportion of ETFs, the smaller illiquidity index ILLIQ. According to the meaning represented by the ILLIQ index, the higher the ILLIQ index is, the worse the liquidity of the corresponding stocks will be. In other words, the above speculation is proved. The original hypothesis H1a cannot be rejected in the three sectors: there is a significant positive correlation between ETFs holdings and stock liquidity, that is, the higher the proportion of ETFs holdings, the higher the stock liquidity.

Secondly, the stock illiquidity index ILLIQ of the three plates in the current period is significant with the stock illiquidity index ILLIQ of the previous period at the level of 1%, and the coefficient is positive, indicating that the stock liquidity has a certain inertia, which is established in the three plates. $Vo1_t$ Coefficients of the

annual stock return volatility of the three sectors are all positive, and the illiquidity index ILLIQ is in direct proportion to the annual stock return volatility of the Vo1, that is, the greater the volatility of the stock return, or the higher the risk of the stock, the worse the liquidity of the stock. This conclusion is valid in the three sectors. Thirdly, the LnSize coefficient of listed company size in the three sectors is negative, and the illiquidity index ILLIO is inversely proportional to the LnSize of listed company, that is, the larger the size of listed company, the higher the stock liquidity. Finally, the stock Outshare of the three sectors is negative, and illiquidity index ILLIO is inversely proportional to 0utshare of tradable shares of the listed company, indicating that the higher the tradable shares of the company, the better the stock liquidity of the listed company.

3.3.2 Influence of ETFs shareholding ratio change on stock liquidity

This section aims to explore the impact of changes in ETFs holdings on the liquidity of winning stocks in the three major sectors. Also, in order to prove whether the increase of ETFs shareholding ratio is prior to the increase of the liquidity of the stock, that is, whether the increase of its shareholding ratio increases the liquidity of the stock, the explanatory variable is the illiquidity index of T-period (ILLIO), and the explanatory variable is the illiquidity index of t-1 period (ILLIQ). The increment (dWeight) of the shareholding ratio of t-1 ETFs, and the control variables are stock volatility (Vol), logarithm of stock price (LnP), price-to-book ratio (PB), logarithm of market value of listed companies (LnSize), proportion of tradable shares (0utshare), and market illiquidity index (MILLTO). The general form of the model is the equation (4).

$$ILLIQ_{it}=\alpha_1 ILLIO_{it-1}+\alpha_2 dWeight_{it-1}+\alpha_3 Risk_{it}+\alpha_4 LnP_{it}+\alpha_5 PB_{it}+\alpha_6 LnSize_{it} +\alpha_7 Outshare_{it}+\alpha_8 MILLIO_{it}+u_i+\varepsilon_{it} \quad (4)$$

The results of differential GMM regression by plate are shown in Table 11.

Table 11: Differential GMM regression results by plate

Variable name	Shanghai and Shenzhen main board underlying stocks	Small and medium-sized board stock	Gem underlying stock
$ILLIQ_{t-1}$	0. 1753275*** (12.20)	0.2059653*** (15.81)	0.1205662*** (8.45)
$dWeight_t$	-0.376225*** (-7.87)	-0.1747871** (-2.47)	-0.735424*** (-4.74)
Vol_t	0.2748734*** (8.42)	0.8755191*** (8.78)	0.281449*** (2.90)
LnP_t	-0.001532*** (-4.02)	-0.0046891** (-2.01)	-0.027172 (-0.37)
PB_t	0.0002291** (2.08)	0.0011065 ** (1.97)	0.0095326* (1.73)
LnSize $_t$	-0.0030455*** (-6.05)	-0.0268798*** (-11.48)	-0.0053681*** (-13.10)
$Outshare_t$	-0.007051** (-2.10)	-0.0447385* (-1.58)	0.003868 (0.25)
$MILLIQ_t$	0.23396*** (14.36)	0.3064598*** (9.53)	0.3608527*** (13.15)
-cons	0.3170586*** (10.47)	0.666664*** (12.69)	0.123507 6*** (2.80)
Number of underlying shares	488	186	47

Note: ***, ** and * are significant at 1%, 5% and 10% respectively.

As can be seen from Table 11, first of all, the coefficient of $dWeight_{t-1}$ in the three plates. The coefficients of the main board, small and medium-sized board and growth enterprise board of Shanghai and Shenzhen are all negative, and all are significant at the level of 1%, which proves that there is an inverse relationship between the change of ETFs shareholding ratio $dWeight_{t-1}$ and illiquidity index ILLIQ, that is, the more the increase of ETFs shareholding ratio in the previous period, the smaller illiquidity index ILLIQ. According to the meaning represented by ILLIO index, the higher ILLIO index is, the worse the liquidity of the corresponding stocks will be. In other words, the above speculation is proved, and the original hypothesis H1a cannot be rejected: positive changes in the t-1 phase shareholding ratio of the exchange traded fund will significantly increase the T-phase liquidity of the underlying listed companies' stocks. Looking at the size of the coefficient, the coefficient of $dWeight_{t-1}$ of the underlying stock on the main board of Shanghai and Shenzhen is -0.376225, indicating that after controlling other variables, every time the exchange fund increases its shareholding ratio by 10% in the last period, its corresponding ILLIQ index will decrease by 0.0376225 in this period. The coefficient of $dWeight_{t-1}$ of the underlying stock of small and medium-

sized board is -0.1747871, indicating that after controlling other variables, every time the ETFs increases its shareholding ratio by 10% in the last period, its corresponding ILLIQ index will decrease by 0.01747871 in this period. The coefficient of $dWeight_{t-1}$ of the underlying stock in GEM is -0.735424, indicating that after controlling other variables, every time the ETFs increases its shareholding ratio by 10% in the last period, its corresponding ILLIQ index will decrease by -0.0735424 in this period.

Among them, the change of the shareholding ratio of exchange traded funds has the greatest impact on the liquidity of the underlying stocks in GEM. According to the investor acceptance hypothesis, this may be due to the introduction of exchange traded funds, which makes the package of stocks of the underlying stock of exchange traded funds attract more attention from the market, and some stocks with low shareholding ratio are more obviously affected by the market attention before this (Subrahmanyam, 1991). Compared with the other two sectors, GEM stocks receive less attention from the market, leading to more active trading of GEM stocks, and thus increased liquidity, while the improvement of liquidity of GEM stocks is more obvious.

Secondly, consistent with the conclusions obtained in the previous section, the stock illiquidity index ILLIO of the three sectors in the current period and ILLIQ of the previous period are both significant at the level of 1%, and the coefficient is positive, indicating that the stock liquidity has a certain inertia (Jegadeesh, 1993). The Vo1 coefficient of annual stock return volatility is positive, and the illiquidity index ILLIO. It is proportional to the annual stock return volatility Vo1, that is, the greater the stock return volatility, or the higher the stock risk, the worse the stock liquidity.

Thirdly, the coefficients of $LnSize_t$ of listed companies in the three sectors are all negative, and the stock illiquidity index ILLIQ is inversely proportional to $LnSize_t$ of listed companies, indicating that the larger the size of listed companies, the higher the liquidity of their stocks.

Finally, the $Outshare_t$ coefficient of the main board of Shanghai and Shenzhen stock market and the small and medium-sized stock market is negative, and the illiquidity index ILLIO is inversely proportional to 0utshare of the outstanding shares of listed companies, indicating that the higher the proportion of outstanding shares of a company, the better the liquidity of listed companies. However, for the underlying stock $Outshare_t$ of GEM, the coefficient is positive. It indicates that the lower the proportion of outstanding shares, the better the stock liquidity of listed companies, which may be due to the following two reasons:

1) The sample of underlying stocks in GEM is only 47, which may result in inaccurate regression due to too small sample.

2) The positive coefficient may be due to the fact that the GEM listed companies are smaller in scale than the other two sectors, and the stock speculation phenomenon is more prominent. The lower the proportion of tradable shares, the more conducive to speculation by large institutional investors, the easier to become the object of speculation, and the higher the stock liquidity.

4. Research conclusions and policy recommendations

4.1 Research Conclusions

Based on the trading data of 721 A-share listed companies held by ETFs from 2011 to 2022 and the shareholding data of exchange-traded funds, this paper investigated and analyzed the shareholding ratio of ETFs and the impact of the change of shareholding ratio on the liquidity of the underlying stocks held by the funds. The samples are further divided into the main board of Shanghai and Shenzhen, the small and medium board, and the growth enterprise Board, and the robustness of each empirical result is tested. The final conclusions of this paper are as follows.

(1) Analysis of the impact of the shareholding ratio of exchange-traded funds on the liquidity of the underlying stocks held by the funds. All samples, the regression results of Shanghai and Shenzhen main boards, small and medium-sized boards, and growth enterprise boards, and the robustness test results show that the Weight coefficient of ETFs shareholding ratio is negative and significant at the level of 1%, which means that the higher the shareholding ratio of ETFs, the smaller the illiquidity index ILLIQ index and Ro11 index. In turn, the higher the proportion of ETFs ownership, the higher the liquidity of the stock.

(2) Analysis of the impact of changes in shareholding ratio of exchange-traded funds on the liquidity of the underlying stocks held by the funds. Regression results of all samples, main boards of Shanghai and Shenzhen, small and medium-sized boards, and GEM show that the dWeight coefficient of ETFs shareholding ratio change is negative, which means that the greater the shareholding ratio change in the last period, the smaller ILLIQ index of the current period, indicating the higher stock liquidity of the current period. That is, the larger the difference between the shareholding ratio of t-1 and t-2, the higher the stock liquidity of T-period, that is, the increase of the shareholding ratio of ETFs will significantly improve the stock liquidity. In addition, the dWeight coefficient of the main board, small and medium-sized board and growth Enterprise Board in Shanghai and Shenzhen was compared. Among them, the absolute value of regression dWeight coefficient of underlying stocks in Growth enterprise Board was the largest, indicating that the change of ETFs shareholding ratio had the greatest impact on the liquidity of underlying stocks in dry growth Enterprise Board. According to the investor approval hypothesis, This may be due to the introduction of exchange-traded funds, which increased the market attention on the package of stocks as the target of exchange-traded funds, and before that, some stocks with low shareholding ratio were more significantly affected by the market attention. Compared with the other two sectors, the GEM stocks received less attention from the market, resulting in more active trading of GEM stocks. And then the liquidity is increased, and the growth enterprise stock liquidity improvement is more obvious.

(3) In the above two regressions, the regression results of all samples, the main board of Shanghai and Shenzhen Stock Exchange, the small and medium-sized board and the Growth Enterprise Market show that the coefficient of ILLIQ is positive, which proves that the stock liquidity of the previous period will have a

significant positive impact on the stock liquidity of the current period, and the current behavior of individuals is affected by the past behavior, and there is a certain inertia. In addition, as the coefficient of volatility Vol of stocks is positive in the research, it proves that the liquidity of stocks with high volatility is generally low, that is, the liquidity of stocks with high risk is low. This may be because the greater the volatility of stock returns, the greater the price difference between the buyers and sellers of the stock in the market. At the same time, the greater the volatility, the greater the uncertainty of both parties to the stock price in the future market, and the greater the adverse selection cost for investors. In order to avoid losses in the process of trading with informed traders, the desire of investors to trade in the market is weakened, resulting in a deep market decline and reduced liquidity. This conclusion holds in all samples, the main board of Shanghai and Shenzhen, small and medium-sized board, GEM board.

4.2 Policy Suggestions

In the 14 years since the launch of exchange traded funds in China, ETFs trading has continued to grow and become increasingly active. From one ETFs in 2005 to 198 ETRs in 2018, the net asset value of ETRs increased from 6.6 billion yuan to 577.3 billion yuan. Especially the rapid development in recent years, but because of the late start of the Chinese exchange traded fund and the international developed securities market still have a certain gap, there are some problems. On the basis of full understanding of the risks and functions of the exchange traded fund, this paper puts forward the following suggestions for promoting the reasonable, healthy and orderly development of the exchange traded fund market.

(1) Continue to promote the market maker system to improve ETFs market liquidity.

The essence of ETFs is an index fund that can be traded in the secondary market just like stocks (Gorton, 1993). In the secondary market driven by orders, there is likely to be a mismatch between the buyer and the seller. Moreover, due to the relatively short history of the Chinese exchange-traded fund market, the market activity is relatively low compared with that of developed countries (Clarke, Shastri, 2001). Institutions such as market makers can quickly match the trading needs of both buyers and sellers, thus improving the liquidity of the exchange traded fund market. Only by improving the liquidity of ETFs itself can it give full play to its unique advantages and positive role in the securities market to attract more investors to participate in the trading of exchange traded funds and their constituent stocks (Brockman, Chung, 2002). Promote liquidity in the underlying securities markets. The Guidance on Liquidity Service Business of Listed Funds of the Shanghai Stock Exchange was officially released in May 2012 and has been revised twice since then. The revisions generally include the types of funds to introduce liquidity services, the selection range of liquidity service providers and the stratification and quantitative indicators of liquidity service providers. Market maker system was officially introduced in ETE market. This shows that the regulation attaches great

importance to the liquidity of ETFs. When pushing forward the market-maker system, the Chinese exchange-traded fund market should fully learn the mature experience of introducing the market-maker system in developed countries and establish the market-maker system gradually. But we should not study blindly.

According to the system design in western market, we should steadily advance the market-making system according to the local conditions, combining the concrete conditions and concrete analysis of our country. In the process of promoting the market maker system, the costs incurred by market makers in the process of trading can be reduced accordingly, and some subsidies can be appropriately provided.

But in addition to subsidies and other incentive measures, we should also strengthen the entry threshold of market making business opportunities and promote the establishment of relevant laws and regulations. To a certain extent, raising the entry threshold can ensure the professionalism of market making business and the ability of market making institutions, so as to standardize the market making institutions.

To promote the establishment of relevant laws and regulations and profit from insider trading, so that it can effectively play the function of market maker system. As liquidity providers in the exchange traded fund market, market makers play an important role in the smooth implementation of arbitrage trading in the ETFs market. ETE's impact on the constituent stock market largely depends on the subscription and redemption of exchange traded funds (Hamm, 2014). In other words, only by improving the liquidity of the ETFs market itself can it further play its function. Improve liquidity in the constituent stock market.

(2) Strengthen the R&D and innovation of ETFs products and its derivatives.

According to the warehouse interest hypothesis, the creation of new securities derivatives based on the existing securities in the market will improve the efficiency of the securities market, so that market participants have more investment products to choose from, and increase the potential arbitrage opportunities (Israeli & Lee, 2017). If the introduction of new investment products will increase the carry trade, and the carry trade necessarily involves the trading of component securities of derivative financial instruments, then the increase of carry trade will increase the liquidity of the underlying securities market. Due to the short establishment time of ETFs market, there are some problems in the shortage of ETFs itself and the introduction of ETFs related derivatives. In view of the above two problems, respectively put forward the following two suggestions.

First, increase the quality index to meet the market demand. The essence of exchange-traded funds is open-ended index funds (Kyle, 1985). The quantity and size of ETFs are related to the quantity and quality of indexes in the securities market. The number of indexes directly affects the amount of ETE, and the quality of indexes determines the size of ETFs. The quality of the index has a direct impact on the market demand of the exchange traded fund with the index as its target. Only by adding high-quality indexes that meet the market demand can the ETFs established with the index as its target be able to meet the market demand and attract the trading of investors, thus increasing the scale of ETFs and expanding ETE's influence in the security market. So that it can maximize its due function.

Although the index system has developed rapidly in recent years, it is mainly represented by the increase in quantity. The advantages and disadvantages of the establishment of indexes and whether they can be well combined with exchange traded funds are directly related to whether the additional indexes can meet the needs of the market. The other is that the index covers less kinds, and the distribution is not uniform. Stock indexes occupy most of our indexes, while commodity indexes and bond indexes are relatively small, still in the starting stage, which inevitably affects the breadth of the categories covered by ETFs products, resulting in our current commodity ETFs and creditor's rights ETFs types are less. The scale is also small, which has affected the development of ETFs market in our country. Therefore, in order to change the above problems, Chinese index compiling institutions should take into account the market demand and add quality indexes that meet the market demand.

In addition, considering the lack of commodity and creditor's rights of Chinese index types, the establishment of the index should be appropriately inclined to these two indexes, and the establishment of the ETFs should also consider the market demand from the existing index to select the exchange traded fund in line with the market demand, so as to enable it to play its due function.

Second, increase the design of financial derivatives related to exchange traded funds. In addition to increasing the variety of indexes and designing ETFs that meet market demand, the design and listing of related financial derivatives should be accelerated. On February 9, 2015, the Shanghai 50ETE option contract was officially traded, which marked the birth of the first ETE option in our country. Derivative financial products related to exchange-traded funds can further broaden investors' investment channels, provide investors with a tool to diversify and hedge risks when constructing asset portfolios, and attract investors to participate in the trading of exchange-traded funds, effectively promoting the growth of the ETFs market. In the same way, investors can have arbitrage opportunities between the fund itself and derivatives, which greatly improves the liquidity of the exchange traded fund market. As mentioned above, only when the liquidity of the ETFs market is improved, can the arbitrage mechanism between ETFs and constituent stocks play a role and thus promote the liquidity of constituent stocks.

(3) Strengthen ETFs market publicity and investor education

Effective marketing and investor education are also important factors in the success of ETFs (Demsetz, 1968). In our country, many investors and even some participating securities companies and institutions have a vague understanding of the exchange-traded fund. In this case, it is particularly important to promote and publicize the exchange-traded fund market and investor education (Bagehot, 1971). Only when investors fully understand ETFs investment products, can they make positive and reasonable investment. Thus, the scale of ETFs trading can be expanded and its influence on the securities market is constantly enhanced. The introduction of exchange-traded fund financial products plays an important role in the development and improvement of financial markets in our country. Only by strengthening the education of investors in the exchange-traded fund market and

improving their understanding of funds, can investors rationally carry out the related transactions of exchange-traded funds and make full use of the functions of exchange-traded funds (Black, 1971). Make it effective to promote the reasonable, healthy and orderly development of our financial market.

4.3 Research limitations and future research directions

Through a series of theoretical and empirical analysis, this paper draws a consistent conclusion that ETFs holdings can effectively improve the stock liquidity of listed companies. However, there are still some shortcomings, which are also the future research direction, mainly including the following two points.

1) This paper only examines the impact of ETFs shareholding ratio and its change on stock liquidity, and does not consider the impact of other aspects of ETFs on stock liquidity, such as the impact of the introduction of relevant regulations on exchange traded funds.

2) Since Chinese ETFs have been established for a short time, the data contains few samples and the length of time is short, only the research is carried out by listed sectors, without further discussion by industry division, so as to analyze whether the shareholding ratio of exchange-traded funds and its changes have different influences in each industry.

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