# Study on the Differential Impact of Northbound Capital on Different Sectors of the Stock Market

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**Abstracts:** As an increasingly important participant in the A-share market, northbound funds have received extensive attention from market investors in recent years. The rapid flow of funds between Hong Kong and the mainland has gradually highlighted the reciprocal influence of northbound funds and different sectors of the stock market. By building a VAR model, this paper finds that there is a significant Granger causality between the net buying of northbound funds and the SSE 50 index, which have a significant effect on each other in a lagged four-period VAR model. This study provides time-sensitive guidance for examining whether there is a tendency of localisation of capital flows between Shanghai and Hong Kong, and whether the information disclosure of the stock markets of the two places is perfect, which facilitates the regulators to examine the reasonableness of the policies, and also provides investors with certain forward-looking basis in understanding the operation mechanism of the capital market.

**Keywords:**Northbound Capital; VAR Vector Autoregressive Model; SSE 50; Shanghai-Hong Kong Stock Connect

## 1. Introductory

It has been more than 30 years since the establishment of China's stock market. With the development of the economy, the financing scale of China's stock market has continued to expand, and its impact on China's and even the global economy has become more and more significant. At the same time, a number of problems have emerged, the most prominent of which is the relatively low degree of openness of China's capital market, in which many foreign investors are unable to participate. Although the introduction of the QFII system in 2003 has brought in a certain degree of foreign capital, domestic capital has also increasingly demonstrated the need for offshore investment. Hong Kong, China, as one of the world's financial centres, plays an important role in the global financial system, and trade exchanges with the Mainland have become increasingly frequent and convenient. In order to ensure the rapid flow of capital between the two regions, broaden the investment fields of domestic and foreign capital, and comply with the trend of RMB internationalisation, the Shanghai-Hong Kong Stock Connect system was officially implemented in 2014, which promotes the two-way opening up and healthy development of the capital markets of Mainland China and Hong Kong.

Accompanied by the rapid flow of capital in the two regions, the reciprocal influence of northbound capital and different sectors of the stock market has gradually come to the fore. In

this paper, we select the representative SSE 50 index to conduct correlation tests with northbound capital, to examine the degree of information flow in the domestic market, and whether the policy formulation and regulatory system is perfect, and to provide investors with reference opinions.

## 2. Research status

In recent years, with the opening of the Shanghai-Hong Kong Stock Connect, scholars have mostly used double-difference modelling to study the impact on the stock market before and after the implementation of this policy, and have obtained rich results. Li Yonggang (2022), in his study on the impact of the "Shanghai-Hong Kong Stock Connect" on the pricing efficiency of China's SSE A-share market, shows that northbound funds, as institutional funds from overseas mature markets, have rich investment and research experience, and are known as the "smart funds" in the market. After the launch of the Shanghai-Hong Kong Stock Connect, the northbound capital has shown a continuous net buying status. [1]This kind of investment behaviour of continuous buying and long-term holding will not only be strengthened by the "herd effect" that triggers other investors in the market to follow the trend, but also its concept of value investment will lead to the locking up of the liquidity of the stocks, which will in turn lead to changes in the volatility. Under the trend of financial integration, along with the continuous inflow of international financial capital, the volatility of the A-share market has also changed significantly. Wu, Dong (2023) The impact of "Shanghai-Hong Kong Stock Connect" on the pricing efficiency of China's SSE A-share market shows that under the impetus of the Shanghai-Hong Kong Stock Connect policy, stock prices can better reflect the relevant information in the market, thus achieving a more efficient allocation of capital market resources.[2] Capital flow, as an important reference indicator of the stock market, reflects the degree of information transmission between the two stock markets. Among them, northbound capital is one of the important factors affecting the A-share market, and the performance of SSE 50, as a representative index of China's stock market, has a feedback reflection on the activity of the capital market. In Sun Qing's (2020) study on the market effect of the Shanghai-Hong Kong Stock Connect, OLS regression and quantile regression are used to analyse the macro market situation; then to examine whether the micro capital flow has a significant effect on the excess return of A&H stocks; and a comparative analysis is conducted on the non-A+H stocks, which concludes that the impact of the capital flow on the doubly-listed stocks is significant and maps behind the fact that the information about a part of the stock market is not well acquired by people.[3] It is concluded that the impact of capital flow on dual-listed stocks is significant, which reflects the insufficient access to information about a part of the stock market as well as the imperfection of the information disclosure mechanism of stock market. [4]According to the ESG Rating and Northbound Capital Shareholding Preferences: Evidence from China study published by uochao Wan and Ahmad Yahya Dawodin(2022), companies listed in CSI 300 during 2015-2020 are selected as the research objects to investigate the impact and mechanism of ESG rating on corporate social responsibility index.[6] To study the characteristics of northbound funds during the COVID-19 pandemic.[5]

Due to the lack of research on the impact of HFT capital flow on the stock market, based on the previous research results, this paper collects the net flow of northbound capital and the

closing price of SSE 50 from January 2021 to October 2023, and explores the impact of the net flow of northbound capital on the closing price of SSE 50 using VAR vector autoregression model, time-series model and impulse response analysis. SSE 50 closing price and the correlation between the two. Granger causality test is also conducted to examine whether the correlation effect between the two is significant.

## 3. Theoretical model and methodology

The VAR model is a non-structural system of equations model. The model is not based on economic theory, and uses a multiple equation linkage in which the endogenous variables are regressed on the lagged terms of all the endogenous independent variables of the model in each equation, thus estimating the dynamic relationship of the endogenous variables. In this paper, a VAR model is built based on the information of the net buying of northbound funds and the closing price of the SSE 50, using more than two years of data, to analyze the correlation between the fluctuations of the two, to forecast the interconnected time-series system as well as to analyze the dynamic shocks of stochastic perturbations on the variables.

The VAR model is an associative form of autoregressive model, so it is called vector autoregressive model. Assuming that there is a relationship between y1, y2, and t, the relationship between the two variables cannot be captured if two separate autoregressive models are built. If the associative form is used, the relationship between the two variables can be established. The structure of the VAR model is related to two parameters. One is the number of variables included N and the other is the maximum lag order k.

Take the example of a VAR model with two variables y1t, y2t lagged for 1 period:

$$\begin{cases} y_{1,\,t} = \mu_1 + \pi_{11.1}y_{1,\,t-1} + \pi_{12.1}y_{2,\,t-1} + u_{1t} \\ y_{2,\,t} = \mu_2 + \pi_{21.1}y_{1,\,t-1} + \pi_{22.1}y_{2,\,t-1} + u_{2t} \end{cases}$$

Where . .

$$u_{1t},\ u_{2t} \sim \text{IID}\ (0,\ \sigma^2),\ \text{Cov}(u_{1t},\ u_{2t}) = 0$$

Written in matrix form is:

$$\begin{bmatrix} y_{1t} \\ y_{2t} \end{bmatrix} = \begin{bmatrix} u_1 \\ u_2 \end{bmatrix} + \begin{bmatrix} \pi_{11.1} & \pi_{12.1} \\ \pi_{21.1} & \pi_{22.1} \end{bmatrix} \begin{bmatrix} y_{1,\,t-1} \\ y_{2,\,t-1} \end{bmatrix} + \begin{bmatrix} u_{1t} \\ u_{2t} \end{bmatrix}$$

Let .    $Y_t = \begin{bmatrix} y_{1t} \\ y_{2t} \end{bmatrix},\ \mu = \begin{bmatrix} u_1 \\ u_2 \end{bmatrix},\ II_1 = \begin{bmatrix} \pi_{11.1} & \pi_{12.1} \\ \pi_{21.1} & \pi_{22.1} \end{bmatrix},\ u_t = \begin{bmatrix} u_{1t} \\ u_{2t} \end{bmatrix},$

and, $Y_{t=}\mu + II_1 Y_{t-1} + u_t$ ,

then, the VAR model containing N variables lagged k periods is expressed as follows:

$$Y_t = \mu + II_1 Y_{t-1} + II_2 Y_{t-2} + \ldots + II_t Y_{t-k} + u_t, u_t \sim IID(0, \Omega)$$

where .

$$Y_t = (y_{1,t} y_{2,t} \ldots y_{N,t})',\mu = (\mu_1\ \mu_2 \ldots, \mu_n)'$$
$$u_t = (u_{1t}\ u_{2t} \ldots u_{Nt})',$$

$$II_j = \begin{bmatrix} \pi_{11.j} & \pi_{12.j} & \cdots & \pi_{1N.j} \\ \pi_{21.j} & \pi_{22.j} & \cdots & \pi_{2N.j} \\ \vdots & \vdots & \ddots & \vdots \\ \pi_{N1.j} & \pi_{N2.j} & \cdots & \pi_{NN.j} \end{bmatrix}, j = 1,2,\ldots,k$$

$Y_t$ is a time series column vector of order $N \times 1$, $\mu$ is a vector of constant terms of order $N \times 1 u_t$, $II_1$, . . . $II_K$ are all $N \times N$-order parameter matrices, $u_t \sim IID$（0，$\Omega$）is an $N \times 1$-order random error column vector, Each of these elements is non-autocorrelated, but there may be correlation between the random error terms corresponding to the different equations. Since the right-hand side of each equation in the VAR model contains only the lagged term of the endogenous variable, which is uncorrelated with is uncorrelated, it is possible to estimate each of the equations in turn using the OLS method, and the parameter estimates obtained are consistent.

## 4.Empirical analysis

### (1) Data sources

In this paper, we select the single-day net buying of northbound funds (hereinafter, ToNorth stands for northbound funds) and daily data of SSE 50 index (hereinafter, IF50 stands for SSE 50 index) from January 2021 to October 2023. All data are sourced from the Shanghai-Hong Kong Stock Connect block of the Hong Kong Stocks section of the Oriental Wealth website.

### (2) Descriptive statistics

Descriptive statistics of all data are performed using R language, and the results are shown in Table 1.

**Table 1** Descriptive statistics of overall data

| Variables | ToNorth | IF50 |
|---|---|---|
| Sainple size | 641 | 641 |
| Minimum value | -1,91,152 | 2,295.92 |
| Maximum walue | 2,172,333 | 4,028.53 |
| Average | 96,517.29 | 2,979.24 |
| Varience | 3.22E+11 | 1.59E+05 |
| 1. Quartile | -404379 | -17.72 |
| Standard dewiation | 567,601.40 | 398.13 |
| Skewness | 0.27 | 0.58 |
| Kutosis | 0.94 | -0.72 |

### (3) Smoothness test

Through the ADF unit root test in Table 2(the result are shown in the Table 2), it can be seen that the T-statistic at the level of 5%, the p-value of the net purchase of funds from the north and the SSE 50 is greater than 0.05, not rejecting the original hypothesis of H0, and further verifying that the two sequences are both non-stationary time series.

**Table 2** ADF test

| ADF test | p-value | Test result |
|---|---|---|
| ToNorth | >0.05 | Not rejected |
| IF50 | >0.05 | Not rejected |
| Diff(ToNorth) | <0.05 | Rejected |
| Diff(IF50) | <0.05 | Rejected |

We perform the first-order difference on the original series by the ndiff() function in R. As shown in Table 2 are less than 0.05, indicating that the logarithmized first-order difference series is a smooth series.

**(4) Parameter estimation**

The smaller the lag order of the VAR model, the degree of freedom will increase relatively. Parameter estimation of the data, through the ATC criterion, SC criterion, HQ criterion and FPE criterion comprehensive judgment, the optimal number of lags of the model was determined to be 4. The model was parameter estimated using the R language, and part of the results are shown in Table 3.

**Table 3** Results of parameter estimation

| variant | To North | IF50 |
|---|---|---|
| To North.t1 | -20.263*** | -17.910*** |
| IF50.t1 | 5.003*** | 4.731*** |
| To North.t2 | -8.884*** | -6.405*** |
| IF50.t2 | 2.897** | 0.195 |
| To North.t3 | -7.979*** | -7.130*** |
| IF50.t3 | 3.006** | 1.434 |
| To North.t4 | -4.310*** | -4.584*** |
| IF50.t4 | 3.591*** | 4.378*** |
| const | -0.906 | 0.857 |
| P-value | 0.000 | 0.000 |

**(5) Granger causality test**

**Table 4** Granger causality test

| Granger Causality Test | p-value | Test Result |
|---|---|---|
| IF50 is not a Granger cause of ToNorth | | Reject |
| IF50 and ToNorth are not Granger causes of each other | | Reject |

From the test in Table 4, it can be seen that the assumption that SSE 50 is not the Granger cause of northward capital, its p-value value is less than 0.05, and the original hypothesis is rejected: the assumption that SSE 50 and northward capital are not the Granger cause of each other, its p-value value is less than 0.05, and the original hypothesis is rejected. So the conclusion is obtained through two Granger causality tests: SSE 50 and northward capital are Granger causes for each other.

**(6) Impulse Response Analysis**

As can be seen in the following two charts, after an information shock of one standard deviation is applied to the SSE50 and northbound funds respectively, both of them experience large positive and negative staggered fluctuations when they are affected by each other. As shown in Figure 1 (left), the response of northbound net buying to the SSE50 closing price perturbation reaches a maximum in period 2, and after a period of fluctuation, it reaches a minimum in period 6, and starts to converge in period 7, and starts to approach 0 in period 10 As shown in Figure 1 (right), the response of the SSE50 to the SSE50 closing price perturbation reaches a minimum in period 2, and after a period of fluctuation, it starts to converge in period 6, and starts to approach 0 in period 10 As shown in Figure 1 (right), the response of the SSE50 to the SSE50 closing price perturbation reaches a minimum in period 2, and after a period of fluctuation, it starts to converges and begins to approach 0 in period 10.
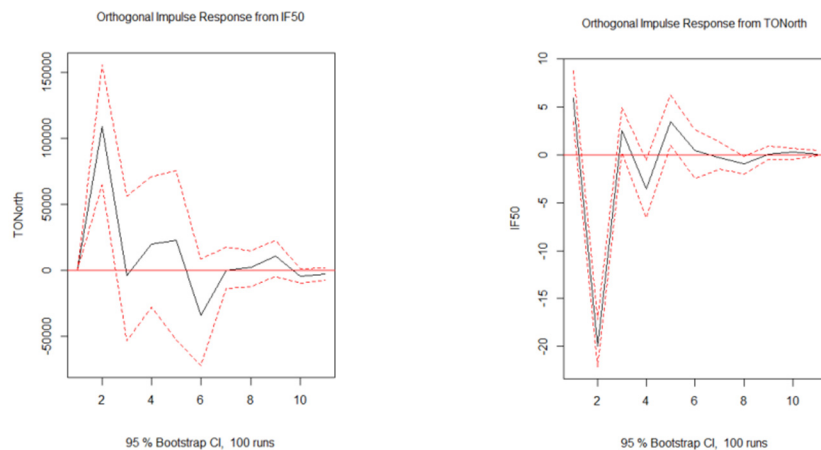


**Figure. 1** Impulse response analysis

**(7) Model testing-autocorrelation test**

The original hypothesis is that there is no autocorrelation, Through the Figure 2 which show the results of coefficient stability test，the p-value is equal to 0.003498, which is less than 0.05, so the original hypothesis is rejected and autocorrelation exists. This paper analyzes the stability of the model using the recursive least squares CUSUM test, the idea is that the equation is repeatedly estimated by using an increasing subset of sample data. The results are shown in the figure: the cumulative sum of the residuals of the northward capital and SSE 50 are within the critical line, which indicates that the parameters of the two models are relatively stable.
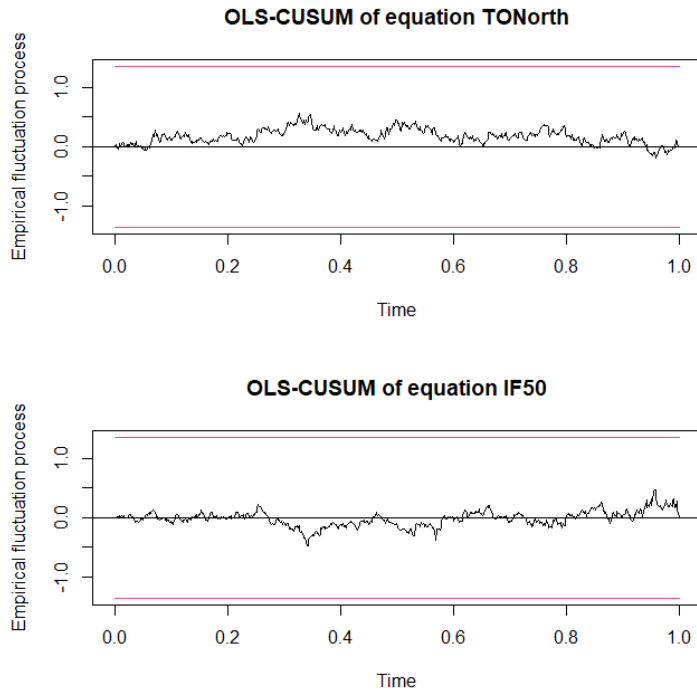
**OLS-CUSUM of equation TONorth**



**OLS-CUSUM of equation IF50**

**Figure. 2** Results of coefficient stability test

## 5. Conclusion

In this paper, we firstly analyze the descriptive statistics of the net buying of northbound funds and the closing price of the SSE 50 index, while the logarithmic data need to be first-order differenced because the time series charts of the variables are both non-stationary series. By building a VAR model, it is found that the correlation between the fluctuations of the two is obvious and the interconnected time series system is stable. There is Granger causality between the two. Specifically, the net buying of northbound funds has a significant impact on the closing price of the SSE 50 Index. When influenced by each other, both the northbound funds and the SSE 50 index have large positive and negative staggered fluctuations. This volatility is more pronounced in the short term and converges in the long term. The results of this paper also show that there is an autocorrelation test for the autocorrelation between the northward capital and the SSE 50 index, which implies that the two have a certain time series correlation.

From the viewpoint of the investment characteristics of northward funds, northward funds usually choose to invest in industries and companies with long-term growth potential, rather than just pursuing short-term gains, and will be diversified into different industries and companies to reduce the risk of a single investment, and are more inclined to invest in assets with better liquidity, such as blue-chip stocks, high-quality bonds and so on.

From a policy perspective, regulatory policies will also have a certain impact on the inflow of northbound funds, for example: the Chinese government implements certain tax incentives for foreign investors, such as income tax exemption, value-added tax, etc., which helps attract the inflow of northbound funds. And when the RMB exchange rate fluctuations, it will also affect the investment decision of the northbound capital. When the RMB appreciates, northbound funds are more willing to buy RMB assets; conversely, they may buy less, which also directly affects the net buying of northbound funds.

Overall, the interrelationship between northbound funds and the SSE Index is obvious and has a greater impact on both sides. Therefore, investors should fully consider the role of northbound funds when making investment decisions so as to better grasp market dynamics and investment opportunities. At the same time, regulators should also strengthen the supervision of northbound funds in order to maintain the stability and healthy development of the market.

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