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A New Index of Private Offering Fund for Stock Strategy

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Abstract: As the deepening reform of China's financial system, private equity funds have been becoming an important part of China's financial system, but there is little research on the index of private equity funds. This paper constructs an index, which covers 98.19% of the stock equity strategy class of equity funds, can better reflect the performance of equity strategy class private equity fund. Through Granger causality test, the Shanghai composite index is a factor that affects the performance of private equity funds in the short term, and in long term they are both factors to each other. The establishment of private equity fund performance index, is conducive to investors and regulatory authorities to further understand the status and history of the private sector. a scientifical private equity fund performance index does not exist at present, so this paper introduced the performance index of private equity funds to improve the financial indicators system, has a strong theoretical and practical significance.

Keywords: Private Offering Fund, Index, Granger Causality Test, Cointegration, VAR

1. Introduction

In 2014, private equity funds develop in large-scale. 2014 is generally considered the great year of China's private equity funds. Private equity funds industry by 2015, continue to maintain the explosive growth. Fund industry association has registered 9036 private equity fund managers, of which 3270 is after August 21, 2014. The registered capital reached 3.03 trillion Yuan totally and capital paid-in reached 2.36 trillion Yuan according to the Interim Measures for the supervision and administration of private investment fund [1]. To establish and improve the fund performance index system, which is suitable for China's securities market, has important theoretical and practical significance to the healthy and stable development of the fund industry and the whole financial industry as well as the investors' right decision [2].

At present, the research on the performance evaluation of the public fund is mainly about the public fund, including the implementation of the passive strategy of the index funds (such as ETF), which is particularly relevant [3]. For the performance of private equity funds, mainly focus on the micro level, focusing on individual analysis, it is difficult for macro system research, it is not conducive to the scientific treatment of a single private equity fund products [4].

Based on the above knowledge, we propose a set of index system which can reflect the performance of China's private equity fund [5, 6]. It is based on the net value of the fund. With the PMI index can reflect the trend of economic change [7]. The performance of China's private equity fund performance index can macroscopically and dynamically reflect the overall situation of China's private equity fund, and then forecast the future development trend of private equity funds in China [8].

There are 3 parts in this article to make ideas clear:
1) Get the data that covers 98.19% of China private fund.
2) Calculate the performance index of private funds.
3) Do statistical analysis and conclusion.

2. Organization Significance

At present, we have Shanghai Composite Index, the Shanghai and Shenzhen 300, the listing Corporation financial index, the overnight rate index of the dismantling of interest rates, real estate price index, etc. [9] However, there is little research on the index of private equity fund industry, while the private placement fund is becoming an important part of China's financial industry [10]. Therefore, the preparation of scientific private equity fund performance index not only enrich the contents of the macroeconomic index system, but also enrich the research results of the development of China's financial industry, and in practice, it can be widely used in

various aspects of social economy, playing its important functions[11].

First, the financial index is an indicator of the state's macro financial situation, but the scientific research on the performance of private equity funds is rare. The mutual relationship between the private equity fund industry and the fluctuation of the financial system is becoming more and more important. Therefore, it is necessary to study the performance of private equity funds in the financial index system.

Second, it is conducive to the formulation and implementation of macroeconomic policies of the government. Through private equity fund business index, the policy authorities can clearly understand the macro dynamics and operating conditions of the private equity fund industry in China. From this, it can provide more accurate and scientific basis for the policy department to carry out the macro policy adjustment.

Third, it is conducive to private equity funds for self-evaluation. According to the preparation method of private equity fund performance index, private equity funds can organize its own internal evaluation system, thus forming a horizontal comparison and vertical comparison. It can find its position, and make clear the problem and improve the space, formulate scientific development goals and plans.

Fourth, it is conducive for investors to make decisions. Through the analysis of private equity fund performance index, investors can effectively judge the performance of private equity fund performance and its long-term fluctuations in the trend. So that it can provide the decision-making basis for personal and institutional financial management, and help to make rational investment decisions, and finally make the whole financial industry rational.

3. Basic Principles Organization of Private Funds Index

3.1. About Some Realities

There are different regulatory agencies in China who have different regulations or policies, and the content and format of information disclosure of private equity funds show great differences. It brings inconvenience to the investors' decision. Compared with the rapid development of private securities investment fund, the information disclosure rules and regulations of the regulatory policies are not uniform. All kinds of private equity fund information disclosure standards are not uniform. Because of that, comparability and operability is not strong. Due to the existing law and the third party custody system, the private equity fund announced product data is credible. However, there is a big adverse selection in the disclosure of private equity funds. Legal about private equity fund information disclosure requirements are scattered in a number of laws and regulations. Many of the provisions are related information disclosure. But Regulatory bodies or industry associations are not to develop a unified information disclosure guidelines or content and format standards, neither for all types of private equity funds, nor for specific types of private equity fund. In contrast, due to the accumulation of a wealth of experience in the public fund supervision, the securities and Futures Commission on the fund company to a number of asset management plans to disclose information is more comprehensive, systematic, specific and clear.

3.2. Organization of the Private Equity Fund Performance Index

We get the data from various private equity fund company website, simuwang.com and howbuy.com. We get totally 17700 funds net data, 14852 of which are running and 2848 of which has been suspended. It covers 98.19% of China private fund. These funds, in accordance with its investment scope of classification, 9889 of them are "equity strategy", 2555 of them are "bond strategy", 959 of them are "executive management futures", 415 of them are "fund portfolio", and 3882 of them are "comprehensive management or others". In accordance with its investment way classification, 9451 of them are "stock bull", 131 of them are "Stock straddle" ,116 of them are "quantify equity",56 of them are" day trading ", 415 of them are " composite strategy ", 691 of them are "private placement" and 6840 of them are "other methods".
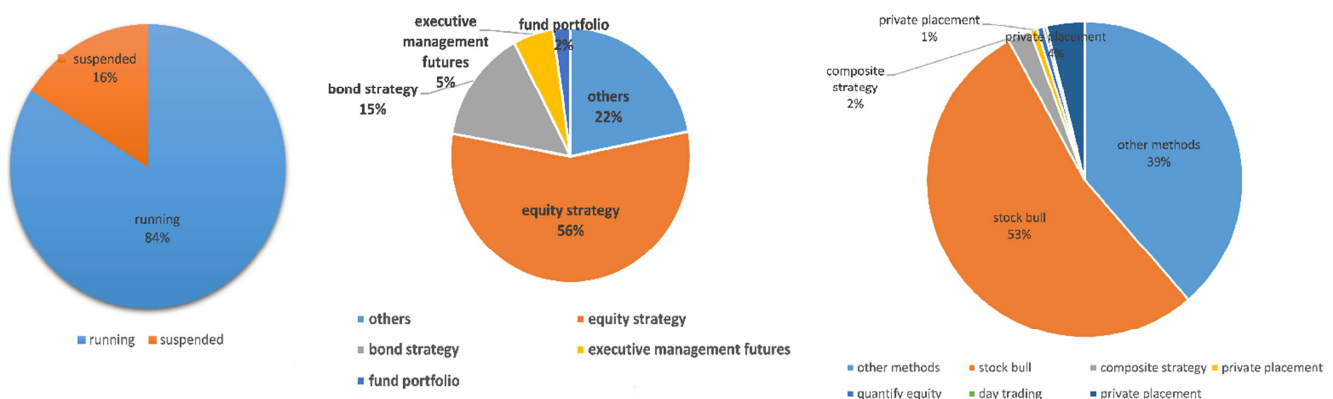
A brief diagram is as below：

Fig. 1. The proportion of private fund data.

4. Calculation of Index

Select 9889 "equity strategy", we find that some of this private equity fund net data has the following characteristics: 1. Private equity fund net data disclosure time is not fixed. Their disclosure time is random and not uniform. For example, "Zhongrong Financial trust-hansin Steady NO.1", its disclosure of the historical value interval scatters from 34 days to 3 days.2. the disclosure of the historical value interval is too large. For example, "Merchants Bank Absolute return". In 2009-2013, only one net data is published. Private equity funds, which do not have these two characteristics, will be called "more complete disclosure of information fund" in this paper.

In view of the fact that mentioned above, we eliminate those "incomplete disclosure of information fund", and get 7752 "more complete disclosure of information fund". In the historical range, we totally get the quantity of those funds:
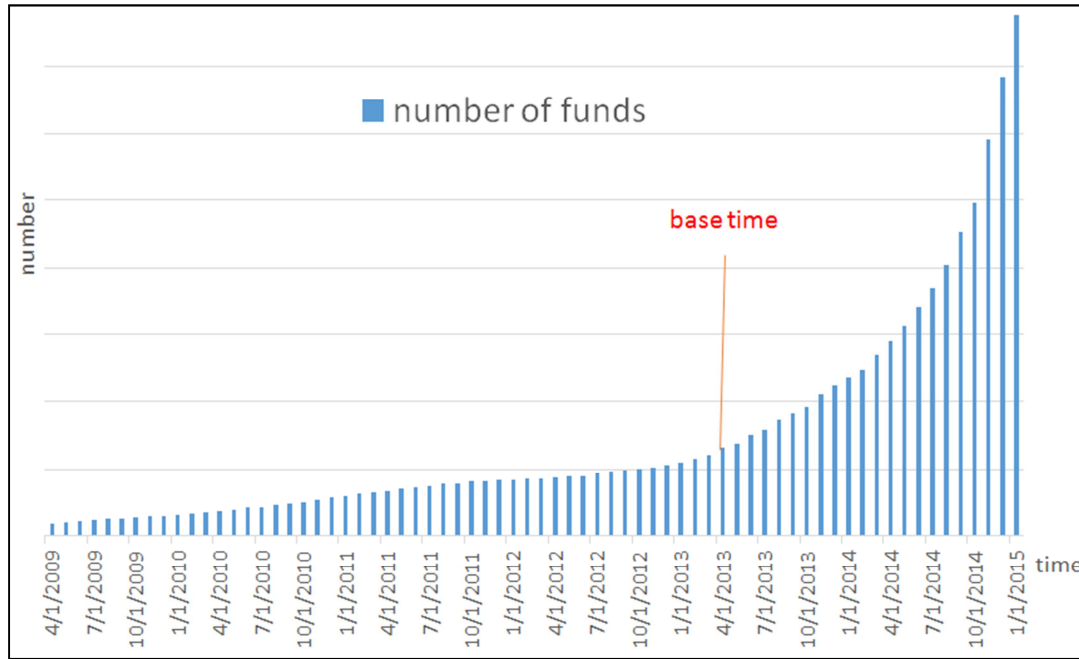

Fig. 2. *Numbers of more complete disclosure of information fund.*

It can be found in figure 2, that, before March 2013, the "more complete disclosure of information fund" was growing slow, but after March 2013, the "more complete disclosure of information fund" was growing fast. Therefore, we can choose March 2013 as the base period.

In this paper, we choose March 18, 2013 as the basic period. And we choose the equity strategy private equity fund as the component of the private equity fund performance index and set the index 1000 in March 18, 2013. We call it $ppei$.

4.1. The Calculation of the Base Period

In March 18, 2013, there was 1643 "more complete disclosure of information fund", we make an arithmetic weighted average and multiply a factor ($\delta(t)$) so the index in March 18, 2013 is 1000.

$$ppei(t) = \delta(t) * \frac{\sum_{i=1}^{n_t} P_i(t)}{n_t} \qquad (1)$$

Where, $t = 1$, $n_t = 1634$

4.2. Time Series Variation of the Ppei

Assume that there is no new fund to join in the $t+1$ day, and there is no fund to suspend in the $t+1$ day, then

$$\delta(t + 1) = \delta(t) \qquad (2)$$

$$ppei(t + 1) = \delta(t + 1) * \frac{\sum_{i=1}^{n_{t+1}} P_i(t + 1)}{n_{t+1}} \qquad (3)$$

Assume that there is new fund to join in the t+1 day, or there is fund to suspend in the t+1 day. We do the following in order to smooth the index in $t+1$ day:

$$\begin{cases} ppei(t + 1) = \delta(t + 1) * \dfrac{\sum_{i=1}^{n_{t+1}} P_i(t + 1)}{n_{t+1}} \\[4ex] ppei(t + 1) = \delta(t) * \dfrac{\sum_{i=1}^{n_t} P_i(t + 1)}{n_t} \end{cases} \qquad (4)$$

Deformation the formula (4):

$$\delta(t+1) = \delta(t) * \frac{\sum\limits_{i=1}^{n_t} P_i(t+1)}{\sum\limits_{i=1}^{n_{t+1}} P_i(t+1)} * \frac{n_{t+1}}{n_t} \qquad (5)$$

4.3. The Interpolation of the Net Fund Data

Though we have already obtained all the data of "the private equity fund performance index", the data is not all corresponding. For example, "Beijing trust- Jing Fu 2" disclosure its net value data every Friday .the "The Milky

Fuxing No. 1" disclosure its net value data every day. The "Huarun trust - Ming" disclosure its net value data mid and end of each month.

In view of the above, it is necessary to use interpolation method. The daily net value of each fund is calculated by interpolation. In this paper, we take the three spline interpolation.

4.4. The Calculation Results
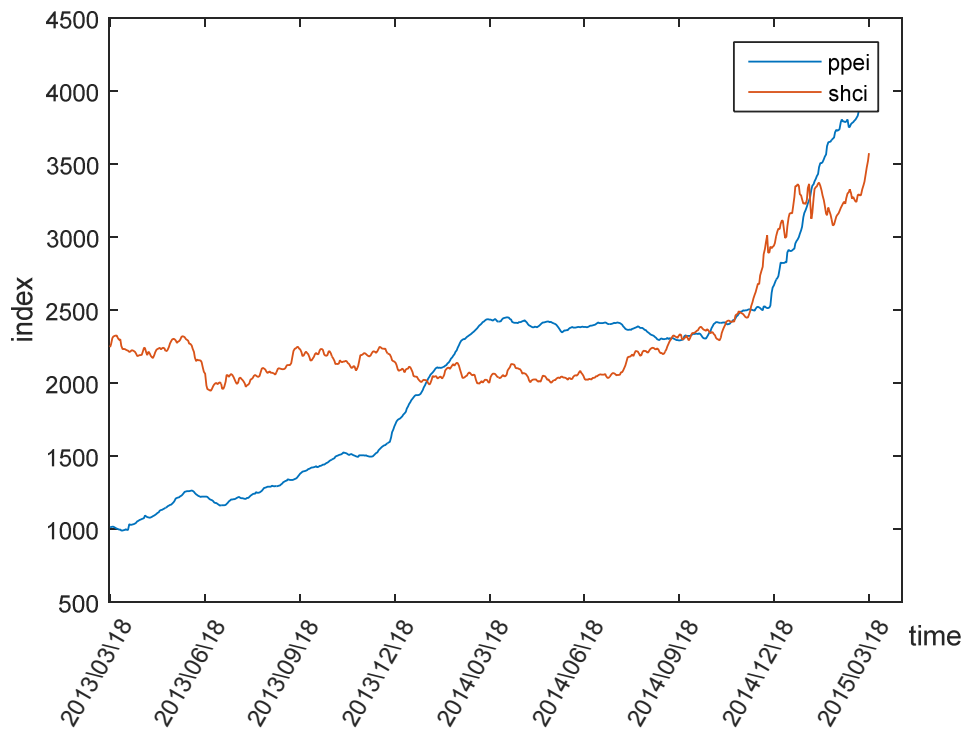
The result is as figure 3.

Fig 3. *Ppei and shci*

Observe figure 3, you can directly get the following conclusions intuitively:

1) When the Shanghai composite index ($shci$) fluctuate, the performance of private equity funds can maintain good performance.

2) When the Shanghai composite index is stable, and the volatility is not obvious, the performance of private equity funds is moderate.

3) In the bull and bear markets, there is an obvious time lag between $ppei$ and $shci$.

5. Statistical Analysis of *ppei*

Suppose there are regression relation between $ppei$ and $shci$, The regression relationship cannot be obtained directly by the least square method. We need to verify whether there is a long-term equilibrium relationship firstly. In order to do that, Cointegration should be done with $ppei$ and $shci$.

5.1. Stationary Test of Variable

The Stationary test of variable time series of the stability of a sequence of mean, variance and covariance is stable. If the mean, variance and covariance of a time series are not changed with time, and the order of the sequence is related to the order of time delay, we call the time series is stationary. Generally speaking, when the time series is not stable, it will lead to the phenomenon of "false regression" and the statistical test is meaningless. Therefore, in order to determine the stability of the sequence and the order of the order, the variable must be tested before the co integration test is conducted. the method of stationary test is as follows: KPSS (Kwiatkowski-Phillips-Schmidt-Shin), PP (Phillips-Person), DFG (Dickey-Fuller GLS), ERS (Point-Optical Elliott-Rothenberg-Stock), NP (Ng-Perron), and ADF (Aug-ment Dickey-Fuller) test, etc.. ADF test is adopted in this paper. The assumption is that the time series are

non-stationary. Namely: when the test value of ADF test is less than the critical value, the hypothesis is rejected, and the time sequence of the test is stationary.

Do ADF test to $ppei$, $shci$ and their first difference. The outcome of the test is as follows:

Table 1. *ADF test.*

Variables	Parameter	Intercept	Intercept and Trend	none
$ppei$	t-Statistic	0.7314	-1.1094	2.2469
	Prob	0.9928	0.9255	0.9945
$shci$	t-Statistic	2.0339	0.093811	1.8078
	Prob	0.9999	0.9972	0.9834
d($ppei$)	t-Statistic	-3.2469	-3.4658	-2.4658
	Prob	0.0179	0.0440	0.0133
d($shci$)	t-Statistic	-9.0384	-9.8908	-8.8980
	Prob	0.0000	0.0000	0.0000

According to the table 1, the variable $ppei$, $shci$ is not stable, but their first difference is stable. The statistical variables t、 F、 R^2 that were obtained by OLS regression were invalid. due to the stability of the first difference of $ppei$, $shci$, there is long term equilibrium relationship.

5.2. Granger Causality Tests

Granger causality test is proposed by Granger (1969).It is causality test method to analyze problems. Based on the system of vector auto regression (VAR), it is assumed that the prediction information of each variable is contained in the time series of these variables. In order to explain the formulation of the method, the following two variables will be used, inspection requirements for the estimation of the following regression:

$$\begin{cases} shci_t = \partial_1 + \sum_{i=1}^{n} \gamma_i shci_{t-i} + \sum_{j=1}^{n} \lambda_i ppei_{t-j} + \varepsilon_{1t} \\ ppei_t = \partial_2 + \sum_{i=1}^{m} \varphi_i shci_{t-i} + \sum_{j=1}^{m} \phi_i ppei_{t-j} + \varepsilon_{2t} \end{cases} \quad (6)$$

If accept $H_{01}: \lambda_1 = \lambda_2 = ... = \lambda_n = 0$, $ppei_t$ is not the Granger cause of $shci_t$.otherwise, $ppei_t$ is the Granger cause of $shci_t$. If accept $H_{02}: \varphi_1 = \varphi_2 = ... = \varphi_n = 0$, $shci_t$ is not the Granger cause of $ppei_t$. otherwise, $shci_t$ is the Granger cause of $ppei_t$.

The first difference of $ppei$, $shci$ are stable. Thus Granger causality test can be done to d ($ppei$), d($shci$). The outcome of the Granger causality test is as follows (table 2)

Table 2. *Granger causality test of shci,ppei and their 1st difference.*

Granger causality test				
lag	Null Hypothsis	F-tatistics	Prob	Conclusion
3	d($shci$) is not Granger cause d($ppei$)	2.94835	0.0322	Reject
	d($ppei$) is not Granger cause d($shci$)	1.03693	0.3756	Accept
4	d($shci$) is not Granger cause d($ppei$)	5.84420	0.0001	Reject
	d($ppei$) is not Granger cause d($shci$)	1.65569	0.1586	Accept
5	d($shci$) is not Granger cause d($ppei$)	4.47016	0.0005	Reject
	d($ppei$) is not Granger cause d($shci$)	2.61933	0.0234	Reject

At a significant level of 0.05, when the lag is 3, the change of the private equity fund performance index is not the Granger cause of Shanghai Composite Index and the change of Shanghai Composite Index is the Granger cause of Shanghai Composite Index. When the lag is 5, the change of the private equity fund performance index is the Granger cause of Shanghai Composite Index and the change of the private equity fund performance index is the Granger cause of Shanghai Composite Index.

5.3. Johansen Cointegration Test and VAR Model

We use Johansen cointegration test method to test the cointegration, which is based on the VAR model. Consider the following P order VAR model:

$$ppei_t = A_1 * ppei_{t-1} + A_2 * ppei_{t-2} + ... \\ + A_p * ppei_{t-p} + B_0 shci + \varepsilon_t \quad (7)$$

$ppei$ is not stable, if there is cointegration between $ppei$ and $shci$, we can draw conclusions, The explanatory variables $ppei$ and the explanatory variables $shci$ have long-term equilibrium relationship.

Equation (7) can be written as follows:

$$\Delta shci_t = \beta_0 + \beta_1 * \Delta ppei_t + (\beta_2 - 1) * ecm_{t-1} \quad (8)$$

where,

$$ecm_{t-1} = shci_{t-1} - \frac{\beta_1 + \beta_3}{1 - \beta_2} * ppei_{t-1}$$

Its representation error correction term.

We already know that $ppei$, $shci$ are not stable. We use Johansen cointegration test method with intercept and no trend in CE. the outcome is as follows(table 3):

Table 3. *Johansen cointegration of shci, ppei.*

	Trace Statistic test		Max-Eigen Statistic test	
Hypothesized NO. of CE(s)	Trace Statistic	Prob	Max-Eigen Statistic	Prob
None	40.23993	0.0000	36.01837	0.0000
At most 1	4.221558	0.0399	4.221558	0.0399

Prob of the two method are all less than 0.05. Reject the original hypothesis and there is a cointegration relationship between $ppei, shci$.

Join a regularization constraint, this constraint is b'*S11*b=I, where I is the unit matrix. the outcome is as follows(table 4)

Table 4. *Maximum of the log likelihood values of the cointegration relationship.*

Normalized cointegrating coefficients (standard error in parentheses)		Adjustment coefficients (standard error in parentheses)	
$ppei$	$shci$	**D(** $ppei$ **)**	$shci$
0.001789	-0.001709		(0.00012)
	(0.27105)	D($ppei$)	0.000646
			(0.00026)

Table 4 shows the maximum of the log likelihood values of the cointegration relationship, the relationship is also the regression of the VAR regression model. This form can be

$$ppei_t = 1.4417 * ppei_{t-1} - 0.4306 * ppei_{t-2} - 0.0116 * ppei_{t-3} + 0.0067 * shci - 11.8531 + \tilde{\varepsilon}$$

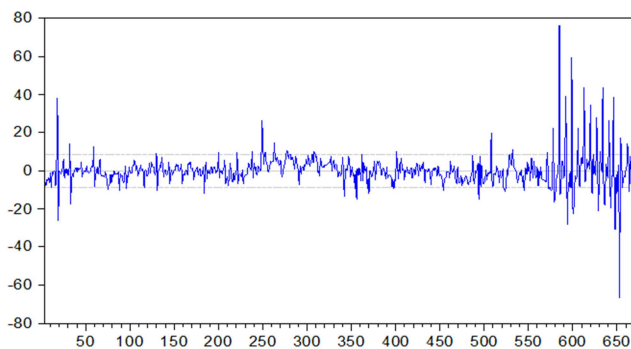VAR test of the residual figure is as follows:

Fig. 4. *Ppei Residuals of VAR model.*

Using the sequence of each predictive value for the iterative calculation, we can output dynamic simulation results of the private equity fund performance index, as shown in figure 4.
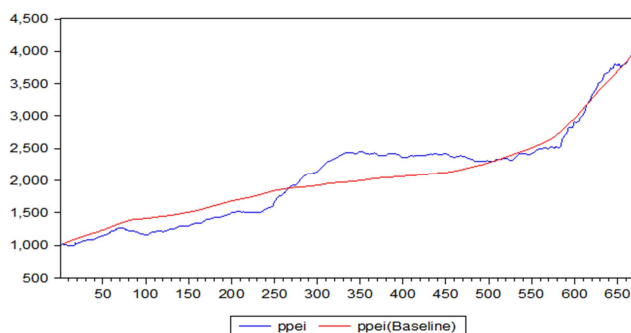

Fig. 5. *Ppei Predictive value.*

6. Conclusion

We organized the private equity fund performance index. Through the statistical analysis, we find that the performance

written as 0.001789* $ppei$ -0.001709* $shci = \tilde{u}$, and there is a positive correlation between $ppei$ and $shci$ the long-term equilibrium, the Shanghai Composite Index rose 1% per share, the private equity fund performance index will rise by 1.0468%.

After the cointegration relationship is obtained from the Johansen cointegration test, the error correction term can be used to construct the error correction term and the VAR model, which is used as the regression variable. Considering the AIC information criterion and the SC criterion, the most appropriate delay is 1, 2, 3. The outcome results of the VAR model with 3 order lags are as follows (table 5):

Table 5. *VAR model estimated coefficient.*

$ppei$ (-1)	$ppei$ (-2)	$ppei$ (-3)	C	$shci$
1.441660	-0.430621	-0.011672	-11.85311	0.006757
(0.03901)	(0.06630)	(0.03898)	(2.22759)	(0.00125)
[36.9562]	[-6.49497]	[-0.29942]	[-5.32105]	[5.41585]

write the VAR model of the estimated results:

of Chinese private equity funds and the Shanghai Composite Index has the following relationship: 1) in the short term, the Shanghai composite index is a factor that affects the performance of private equity funds. In the long term, the two are mutually affected. 2) there is a positive correlation between the private performance and the Shanghai stock index.

The establishment of private equity fund performance index, is conducive to investors and regulators to understand the situation and history of the private fund industry. The current private equity fund performance index does not exist, so this paper introduced the performance index of private funds to improve the financial indicators system, with a strong theoretical and practical significance.

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