Relationship between stock index and increments of stock market trading accounts

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Abstract. In this paper, we pay attention to the relationship between stock index and increments of trading accounts in A, B share market and funds. We show that there exists bilateral relationship between A, B index and their trading accounts increments. However, Granger causality only exists from stock index to increments of funds accounts. Regressions show that the investors' sentiment will be easily driven by the index in the same direction, which imply momentum strategy in a very short period. In comparison, when using weekly data, only increments of funds accounts Granger cause the stock index. These uncover the differences between fund managers and small investors while investing on stock market. We also analyse the relationship between index volatility and trading accounts volatility.

Keywords: stock index; increments of trading accounts; investors' sentiment ; momentum strategy

1 Introduction

According to efficient market hypothesis(Fama, 1970[2]),in a weak-form efficient market, history of stock price can not help to anticipate future trend of stock price. So how stock market performs in the past should not affect the trading accounts increments significantly. However, if the stock market performance has significant influence on daily or weekly trading accounts increments, we can conclude that this market is not weak-form efficient, and may exist a phenomenon of herd behavior(Shiller, 1995[6]),which also tested to be existed in China (Jiang et al., 2003[8]), or the small investors employ some strategies on opening the trading accounts, say, momentum or contrarian. Considering short sale is still forbidden in China stock market, increase of trading accounts increments implicate capital inflow and small investors' optimistic perspectives on future stock market, which will probably result in further rise of index. So our study is motivated by the curiosity on the relationship between index and increments of trading accounts. There were some

papers working on these fields. Che(2002)[9] and Zhu(2000)[5] both found a positive relationship between the stock index and the increments of trading accounts in China stock market. Che(2002) [9]chose 104 daily data sampling from August 1st 2000 to December 29th 2000 and employed a simple linear time series regression to receive a coefficient which suggest a high correlation between the index and increments of trading accounts. But Che's approach was unstable since his data ranged too short and did not consider the interrelation and affection of lag effect. Zhu(2000)[5] chose 19 monthly data ranged from January 1999 to July 2000 and also used a simple linear regression to receive a positive correlation which had almost a similar problem with Che(2000)[9]. Zhan(2002)[10] believed a high volatility of China stock market would lead to a high volatility of accounts increments, but he did not do empirical study on the relationship of volatility. With regard to trading strategy, Jegadeesh and Titman(1993)[4] first notice the momentum effect in their study on the return of winner and loser's portfolio. On the other hand, DeBondt and Thaler(1985)[1] find evidence on contrarian as they exam the market in a longer horizon. None have pay attention on whether the similar effects exist on the trading accounts, which might be a very important quantity to reveal the view of those who are still outside the market, especially in China, where short selling is prohibited.

Our primary contributions are analyzing the relationship between Hushen 300 index, B index and increments of trading accounts in A, B share market and funds market through Granger causality test. Moreover, we find evidences that the investors in China are easily affected by the recent performance of index, which suggest that there exists a momentum effect on opening new trading account. We illustrate the economics intuition in detail, uncovering different trading strategies between small investors and fund managers.

First of all, we find that there exists close relationship between A, B index and daily increments of trading accounts on A, B share markets. Our empirical studies show that there exists bivariate causality between Hushen 300 index and daily increments of A share market, which also exists between B index and daily increments of B share market (Fig 1). But causality disappears when we use weekly data (Fig 2). These consequences provide indirect evidences that most of the small investors pursue momentum strategies when investing on A,B share market because they choose to create new trading accounts immediately after stock index grows. Although it is not surprising that the increments of trading accounts will affect stock index, since short sale is prohibited in China stock market, the impacts of the new investors on the stock index might be plausible. Because capital flows not only come from the new incomer, they also come from the former investors. As a result, it is hard to judge whether the former investors may share the same ideas with the new incomers. So is it to their investment direction.

Secondly, there exists a significant Granger causality from Hushen300 to daily increments of funds trading accounts when our empirical studies use daily data (Fig 1), but this causality fade as we use weekly data (Fig 2), which is consistent with the empirical result on Hushen 300 index and increments of A share market. This result conveys that the sentiments of funds investors are also significantly affected by Hushen300 index. As index increases, small investors hold optimistic views on future, so they will choose to invest on either stock market or funds immediately.

And we pay attention to another interesting consequence that daily increments of funds accounts provide no help to predict index (Fig 2). It may be caused by different trading strategies between small investors and fund managers. Although small investors create new funds accounts when stock index rise, their fund managers are not likely to invest on the stock market at once. But funds will affect the stock index in a longer horizon, the effect which we tested with weekly data is significant lagged for 2~4 weeks, and it may be consistent with the managers' strategies on revising portfolios with a much larger amount of capitals than which owned by small investors.

Moreover, we want to estimate in detail how investors' sentiments are affected by the index. Thus, besides Granger Causality test, we regress the increments of trading accounts directly on the stock index. It shows that the sentiments of those who have not participated in the market will be influenced immediately by the stock index in a surprisingly short period. And the result also implicates slightly differences between the characteristic of small investors immediately investing on stock markets and their counterparts investing on funds (Fig 3).At last, we analyse B index with Granger causality test and variance decomposition to find out how much the increments of B share trading accounts will affect B index (Fig 4). The reason why we choose B share market is that B share market is less liquid than A share market, and most information will efficiently affect A share market more immediately than B share market. So we suppose A index as an agent of information, and increments of B share trading accounts as an agent of capitals entering into B share market, and use A index as a control variable. The empirical results, including Granger causality test (Fig 4) and variance decomposition, both show that A index and increments of B share trading accounts have significant effect on B index (Fig 4).

2 Empirical study

We do empirical study to provide evidence for our former discussion, and we mainly employ Granger causality test and Variance decomposition introduced as followed.

2.1 Granger causality test

Granger (1969)[3] proposed a model to test the bivariate dynamic relationship between two variables, which is expressed as

$$Y_t = \sum_{i=1}^{m} \alpha_i Y_{t-i} + \sum_{i=1}^{m} \beta_i X_{t-i} + u_t \tag{1}$$

In equation (1), Y_t and X_t represent two variables, and there may exist causality between them. If $\beta_1, \beta_2, \beta_3 \ldots, \beta_m$ are significant different from 0 ,then X_t Granger cause Y_t. If $\theta_1, \theta_2, \theta_3 \ldots, \theta_m$ are significant different from 0 ,then Y_t Granger cause X_t. If both $\beta_1, \beta_2, \beta_3 \ldots,$ β_m and $\theta_1, \theta_2, \theta_3 \ldots, \theta_m$ are significant different from 0，then there exists bilateral relationship

between X_t and Y_t, or they are both affected by another variable Z_t. If β_1, β_2, β_3…, β_m and $\theta_1, \theta_2, \theta_3 …, \theta_m$ both are insignificant statistically, then there exists no causality between X_t and Y_t.

2.2 Variance decomposition

Sims(1980)[7] provided a method to analyse variance of VAR model, which is expressed as

$$Z_t = [Y_t, X_t]', e_t = [\varepsilon_{yt}, \varepsilon_{xt}]'$$

$$Z_t = A_0 + \sum_{i=1}^{m} A_i Z_{t-i} + e_t \tag{2}$$

Equation (2) is a VAR (Vector Auto regression)

$$Z_{t+n} - E_t Z_{t+n} = e_{t+n} + A_1 e_{t+n-1} + A_1^2 e_{t+n-2} + ... + A_1^{n-1} e_{t+1} \tag{3}$$

Equation (3) gives n-period forecast errors of Z

$$Y_{t+n} - E_t Y_{t+n} = \phi_{11}(0)\varepsilon_{yt+n} + ... \phi_{11}(n-1)\varepsilon_{yt+1} + \phi_{12}(0)\varepsilon_{xt+n} + ... \phi_{12}(n-1)\varepsilon_{xt+1} \tag{4}$$

$$\sigma_y(n)^2 = \sigma_y^2[\phi_{11}(0)^2 + \phi_{11}(1)^2 + ... \phi_{11}(n-1)^2] + \sigma_x^2[\phi_{12}(0)^2 + \phi_{12}(1)^2 + ... \phi_{12}(n-1)^2] \tag{5}$$

From equation (4) and (5), we can find that $\sigma_y(n)^2$ is equal to a weighted sum of σ_y^2 and σ_x^2

2.3 Empirical result

Limiting by data on increments of trading accounts, our data spans from May 8th in 2006 to Jan 11th in 2008, containing 414 observations. In this period, China stock market obviously presents a bull market. Hushen300 index rise from 1218.44 point to 5699.15 point, and at the same times A share trading accounts, B share trading accounts and funds accounts have increased by 57.6%, 44.97% and 1385.09% respectively.

   We give the empirical results lagged 8 periods. There are at least two supported reasons: Firstly, SIC and HQ test show that we should choose model which lag less than 8 periods; Secondly, with daily data, 8-period lag can already cover the lag effect in last one and a half week, while, with weekly data, we can test our hypothesis in about last two months. So even if we can find statistically significant influences for more than 8-period lag, it is not convinced that, for short horizon investors, their sentiments will be affected heavier by the index more than 1 week before than the index just in last 1week, which is much more sceptical in weekly test. What's more we find their coefficients' significances deflate quickly along with lag periods after the peak value. Due to these two reasons mentioned above, we only give 8-period lag results. However, we actually do empirical studies on more than 8-period lags and do not find significant differences.

Fig 1 reports daily relationship between index and increments of trading accounts. x_A represents logarithm growth of daily increments of trading account on A share market. x_B represents logarithm growth of daily increments of trading accounts on B share market. x_F represents logarithm growth of daily increments of funds trading accounts. r_{A300} denotes daily logarithm return of Hushen300 index. r_B represents daily logarithm return of B index. And the numbers in Fig 1 are probabilities that we can not deny H_0 of Granger causality test (H_0 is the original hypothesis that the independent variable X provides no help to predict dependent variable Y).

Lag	Relationship between x_A and r_{A300} (Dependent Variable/ Independent Variable)		Relationship between x_B and r_B (Dependent Variable/ Independent Variable)		Relationship between x_F and r_{A300} (Dependent Variable/ Independent Variable)	
	r_{A300}/x_A	x_A/r_{A300}	r_B/x_B	x_B/r_B	r_{A300}/x_F	x_F/r_{A300}
1	0.1156	0.0000	0.1677	0.0000	0.0797	0.8719
2	0.0952	0.0000	0.0003	0.0000	0.1829	0.2402
3	0.0227	0.0000	0.0071	0.0000	0.3671	0.0070
4	0.0190	0.0000	0.0009	0.0000	0.3921	0.0000
5	0.0160	0.0000	0.0053	0.0000	0.5213	0.0001
6	0.0582	0.0000	0.0083	0.0000	0.7848	0.0000
7	0.1064	0.0000	0.0072	0.0000	0.8413	0.0000
8	0.1275	0.0000	0.0018	0.0000	0.9299	0.0000

Fig 1: Daily relationship between index and increments of trading accounts

Fig 1 shows us that index has a significant impact on investors' trading accounts including A,B share and funds trading accounts, while the increments of A,B share trading accounts affect A,B index significantly on some lags. Different from small investors' trading accounts, increments of funds accounts do not have a significant impact on the index. This results show that index can easily affect investors' sentiments, and small investors may take a momentum strategy in short periods. In comparison, fund managers adopt totally different strategies from small investors. The reason that one-period lag of x_F is significant may be caused by optimistic psychological influence from new funds.

Fig 2 reports weekly relationships between index and increments of trading accounts. x_{AW} represents logarithm growth of weekly increments of trading account on A share market. x_{BW} represents logarithm growth of weekly increments of trading account on B share market. x_{FW} represents logarithm growth of weekly increments of funds trading account r_{A300W} denotes weekly log return of Hushen300 index. r_{BW} represents weekly log return of B index. And the numbers in Fig 2 are also probabilities we can not deny H0 of Granger causality test (H0 is the original hypothesis that the independent variable X provides no help to predict.

	Relationship between x_{AW} and r_{A300W} (Dependent Variable/ Independent Variable)		Relationship between x_{BW} and r_{BW} (Dependent Variable/ Independent Variable)		Relationship between x_{FW} and r_{A300W} (Dependent Variable/ Independent Variable)	
Lag	r_{A300W}/x_{AW}	x_{AW}/r_{A300W}	r_{BW}/x_{BW}	x_{BW}/r_{BW}	r_{A300W}/x_{FW}	x_{FW}/r_{A300W}
1	0.9882	0.3837	0.3975	0.5874	0.9775	0.2034
2	0.9830	0.5565	0.4066	0.5898	0.0405	0.1022
3	0.9806	0.7985	0.6327	0.5991	0.0877	0.1753
4	0.8532	0.6573	0.8718	0.3649	0.0631	0.3350
5	0.8621	0.6287	0.7329	0.4000	0.1208	0.3457
6	0.7379	0.2243	0.8864	0.2758	0.1728	0.1063
7	0.6552	0.2359	0.8927	0.3959	0.2641	0.2247
8	0.6602	0.2615	0.7417	0.4456	0.4014	0.4457

Fig 2: Weekly relationship between index and increments of trading accounts

From Fig 2 , we can find the weekly relationship between index and increments of trading accounts are very weak. Index changes in this week do not affect investors' sentiments in next week, which is reasonable that investors' sentiments can only be affected by the nearest trading days. And Fig 2 also tells us that increments of small investors do not impact the index on a longer horizon. However, increments of funds accounts will significantly affect index in the next 2~4 weeks. These results provide cues on fund managers' trading strategies that they construct their portfolios in longer periods comparing with small investors. The phenomena may be caused by the two facts: Firstly, fund managers should manage great volumes of moneys and they must consider the liquidity when constructing their portfolios. Secondly, fund managers pursue different strategies from small investors, such as contrarian strategy or index replication strategy.

Fig 3 reports how stock index will affect investors' sentiments in detail. The variables are the same as above, and $r_A(-i)$, $r_B(-i)$ represent the ith lag of logarithm return of A and B index respectively. The lag terms are chosen according to Schwarz Information Criterion. NA means that the corresponding lag term is not chosen according to SIC.

Regression results	r_{A300}	$r_{A300}(-1)$	$r_{A300}(-2)$	$r_{A300}(-3)$	R-square
x_A	1.2012***	1.8598***	0.9329***	NA	0.1374
x_F	NA	NA	2.5051*	3.0728**	0.0187
Regression results	r_B	$r_B(-1)$	$r_B(-2)$	$r_B(-3)$	R-square
x_B	1.2490***	2.7360***	0.7241*	NA	0.1609

Fig 3: Regression of increment of stock market trading account on the stock index

Fig 3 tells the consequence of three linear regressions on daily data. From the table, we can find the investors' sentiments will be significantly affected by the performance of the last 3 days and that day when they open the trading accounts. The positive and significant coefficients demonstrate that small investors will tend to open new trading accounts when the stock index rise, and vice versa if the stock index fall down. The slight differences between consequence of regressions on investors directly investing on A,B stock market and those who invest on funds announce that investors planned to enter into A,B stock market are influenced much easier by the extreme short terms performance, which are no more than two days in the table; their counterparts who invest on funds may react to the index in few days lag, which might be more conservative.

We also impose similar regressions on the weekly data, and all the parameters are insignificant with a very low level of R-square. The result proves our discussion indirectly that the sentiment of investors only be affected in a very short period.

Fig 4 reports how B share trading accounts and A index will affect B index in Shanghai stock exchange. r_{AS} represents logarithm return of A index in Shanghai stock exchange. Other variables are the same as above.

	Granger causality test (Dependent variable r_B, independent variable x_B, r_{AS})		Variance decomposition (Dependent variable r_B, independent variable r_B, x_B, r_{AS})		
Lag	x_B	r_{AS}	r_B	x_B	r_{AS}
1	0.3907	0.0000	95.3125%	0.4218%	4.2657%
2	0.0008	0.0001	92.3749%	3.6650%	3.9600%
3	0.0166	0.0004	92.7937%	3.1991%	4.0072%
4	0.0035	0.0008	91.3763%	4.5746%	4.0491%
5	0.0120	0.0001	90.4113%	4.8746%	4.6841%
6	0.0081	0.0000	88.1393%	5.1758%	6.6849%
7	0.0040	0.0000	87.0920%	6.4267%	6.4813%
8	0.0018	0.0001	85.7398%	7.6738%	6.5865%

Fig 4: Explain B index by increments of B share trading accounts and A index

Fig 4 shows that increments of B share trading accounts and A index in Shanghai stock exchange will significantly affect B index in Shanghai stock exchange, which is proved both by Granger causality test and variance decomposition. But in detail, we find that with variance decomposition increments of B share trading accounts and A index in Shanghai stock exchange provide only at most 15% explanation to B index in Shanghai stock exchange. And the part of explanation does not increase significant even we add more lags. This result shows that due to market partition, B index and A index face different risk, and whether B share market will incor-

porate into A share market may be a most important cause. Another possible reason is that new investors on B stock market have less influence than the former ones, as they might be attracted only by the returns of B index while lack the knowledge of risk in B stock market.

3. Conclusions

After studying on the relationship between A,B index, increments of trading accounts in A,B and funds markets, we receive three important conclusions.

First of all, there exists bilateral relationship between A, B index and their trading accounts increments. Index significantly affects investors' sentiments, especially in a very short period. This evidence denotes that those who incline to invest directly on A,B share market are likely to pursue momentum strategy to create new trading accounts. And investors investing on funds pursue a similar strategy on opening the trading accounts, although they might be a little more conservative. Generally speaking, all small investors incline to pursue momentum strategy to create new trading accounts,

Secondly, Hushen300 index Granger causes daily increments of funds accounts. However, weekly increments of funds accounts Granger cause Hushen300 index. These implicate the different trading strategies between small investors and fund managers. Small investors are very likely to construct their portfolios as soon as they create new trading accounts, but fund managers revise their portfolios in the next 2~4 weeks after receiving those funds from their clients.

Thirdly, although A index and increments of B share market trading accounts affect B index significantly, increments of B share market trading accounts can provide no more than 8% explanation to volatility of B index.

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