The China A shares follow random walk but the B shares do not

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Abstract

The China A-Share stocks and the China B-Share stocks are common stocks issued by companies incorporated in China. These two classes of common stocks differ in the nationality of the investors each is restricted to by law. For the most part, the A shares, quoted in the Chinese yuan, or renminbi, are for Chinese nationals while the B shares, quoted in foreign currencies, are for non-Chinese nationals and residents of Macau, Hong Kong and Taiwan. This paper identified eighty-six companies issuing both the A and B shares and tested if these shares¡¦ weekly returns follow a random walk. Employing the Lo and MacKinlay variance ratio test statistics, it is discovered that five times more B shares rejected the random walk as did the A shares. Moreover, both the Shenzhen and Shanghai B-Share indexes reject the random walk while neither the Shenzhen nor Shanghai A-Share index reject the random walk.

1. Introduction

The China A-Share stocks and the China B-Share stocks are common stocks issued by companies incorporated in China. These two classes of common stocks differ in the nationality of the investors each is restricted to by law. For the most part, the A shares, quoted in the Chinese yuan, or renminbi, are for Chinese nationals while the B shares, quoted in foreign currencies, are for non-Chinese nationals and residents of Macau, Hong Kong and Taiwan.

The question of whether the either or both classes of stocks follow random walk, that these stocks have as much a chance of a rise in price as its fall on any given day despite having a long-run positive expected return, have been studied by many with mixed results.

Su and Fleisher (1997), using variance ratios and daily index returns, rejected the random walk for both the A-Share and B-Share markets. Additionally, they obtain weaker rejections when weekly returns are used. Laurence *et al*. (1997), using the Ljung-Box test statistics, also found that the daily index returns are significantly autocorrelated for both the A and B shares. This deviation from the efficient market hypothesis is confirmed by Chen and Hong (2003), employing a generalized spectral derivative test onto daily index returns. These authors also find that the A shares, despite being inefficient in their own rights, are more efficient than the B shares. Long *et al*. (1999), applying variance ratio and runs tests on weekly returns, asserted that both the A shares and the B shares trading on the Shanghai exchange follow random walk. Darrat and Zhong (2000), applying the Lo and MacKinlay (1988) variance ratio test onto the daily A-Share index returns, rejected the random walk for the A-Share market. Lee *et al*. (2001), using daily returns, rejected the random walk for both the A shares and the B shares. A few years later, Seddighi and Nian (2004), applying the Dickey-Fuller unit root test onto not just daily index returns, but daily returns from eight Chinese companies as well, rejected the random walk, albeit not very strongly. Still later, Lima and Tabak (2004), basing their test statistics also on variance ratios, found that the daily A-Share returns are weak-form efficient but rejected the random walk for the B-Share market. Overall, past results, though mixed, do seem to be in favor of rejecting the random for the China markets.

One point that comes to mind while reviewing the past researches is that the returns used are almost always daily index returns. Few authors used weekly returns and fewer still used returns from individual stocks. One obvious reason for choosing daily returns over weekly returns is of course the former are more numerous than the latter, but as in the words of Lo and MacKinlay (1988), who derived the variance ratio test statistic used in this paper, there are disadvantages:

While daily sampling yields many observations, the biases associated with nontrading, the bid-ask spread, asynchronous prices, etc., are troublesome. Weekly sampling is the ideal compromise, yielding a large number of observations while minimizing the biases inherent in daily data.

Similarly, the reason for choosing index returns over individual stock returns could be just a matter of convenience. On the other hand, using individual company data could serve to either confirm or refute results based only on aggregate market data. This is especially helpful if historical results are mixed.

Another point of note is that whether or not the random walk is rejected is seemingly time-dependent. That is, rejection of the random walk hypothesis is prevalent in early researches while later rejections are more tenuous. This is in line with the Lock (2007) findings that early rejections of the random walk hypothesis for the Taiwan stock market are refuted when more recent data are used. For young markets, which the China markets are, data currency is important.

This paper is an attempt to determine if the A-Share indexes, the B-Share indexes, the individual A-Share as well as B-Share stocks follow random walk. To address the problem raised previously concerning the usage of daily returns, weekly returns are used instead. And in order to obtain a better determination of whether the random walk is followed, eighty-six companies issuing both the A and B shares have been identified, and the returns from these shares are tested for the random walk in addition to the indexes. For currency of data the sampling period will run from 1992 to 2007. The variance ratio methodology of Lo and MacKinlay (1988) is used.

This paper is organized as follows: Section 2 presents the methodology. Section 3 presents the data and empirical results, and section 4 concludes.

2. Methodology

This paper uses the variance ratio estimator derived by Lo and MacKinlay (1988) when determining if the U.S. weekly stock returns follow random walk. The basic idea is that given an infinite series of log stock prices $\sum_t X_t$, where $X_t = \log P_t$, the

log of a stock price at time t, if the variance of $X_t - X_{t-q}$ is q times the variance of

$X_t - X_{t-1}$ for all q, then the increment of P_t is said to follow a random walk. Equivalently, letting X_t denote the log of the price of some stock at time t, if $X_t = \mu + X_{t-1} + \varepsilon_t$, then the price variable is said to increment in a random walk fashion. Here μ stands for an arbitrary drift parameter, and ε_t is the random

disturbance allowed to vary with time and deviate from normality. This specification of X_t is far more lenient than the traditional random walk specification which restricts ε_t to being identically and independently distributed (i.i.d.).

To test if the variance of the price increments is linear in the sampling interval, an unbiased estimate of 1/q times the variance of $X_t - X_{t-q}$ is estimated together with an unbiased estimate of the variance of $X_t - X_{t-1}$ for q = 2, 4, 8, and 16. Calling the ratio of the first estimate to the second estimate VR(q), q = 2, 4, 8, 16, if the price does increment in a random walk fashion, then all the estimated variance ratios , i.e., VR(2), VR(4), VR(8), and VR(16), will all be very close to one. For the purpose of this study, I require that all four ratios to have values close to one. If even one of these ratios is found to deviate too much from one, the random walk is rejected for the price series. These ratios are estimated and tested for significant deviation from unity as follows.

Given nq+1 consecutive X_t s, written as $X_0, X_1, X_2,..., X_{nq}$, let

$$\hat{\mu} = \frac{1}{nq}\sum_{k=1}^{nq}(X_k - X_{k-1}) = \frac{1}{nq}(X_{nq} - X_0) \quad , \quad \overline{\sigma}_a^2 = \frac{1}{nq-1}\sum_{k=1}^{nq}(X_k - X_{k-1} - \hat{\mu})^2 \quad , \quad \text{and}$$

$$\overline{\sigma}_c^2(q) = \frac{1}{q(nq-q+1)(1-\frac{q}{nq})}\sum_{k=q}^{nq}(X_k - X_{k-q} - q\hat{\mu})^2 \quad , \quad \text{then} \quad \overline{\sigma}_a^2 \quad \text{and} \quad \overline{\sigma}_c^2(q) \quad \text{are}$$

unbiased estimators for the variances of $X_t - X_{t-1}$ and $X_t - X_{t-q}$ respectively (Lo and MacKinlay, 1988). Now, let $VR(q) = \dfrac{\overline{\sigma}_c^2(q)}{\overline{\sigma}_a^2}$, q = 2, 4, 8, and 16, then under the random walk hypothesis, the four variance ratios $VR(2)$, $VR(4)$, $VR(8)$, and $VR(16)$ will all have values close to one since the variance of the increments of a random walk is linear in the sampling interval. To test whether a ratio deviates enough from one to reject the unity null, Lo and MacKinlay (1988) derived the asymptotically standard normal statistic $z(q) = \dfrac{\sqrt{nq}\,(VR(q)-1)}{\sqrt{\sum_{j=1}^{q-1}\left[\dfrac{2(q-j)}{q}\right]^2 \hat{\delta}(j)}}$, where

$$\hat{\delta}(j) = \frac{nq\sum_{k=j+1}^{nq}(X_k - X_{k-1} - \hat{\mu})^2(X_{k-j} - X_{k-j-1} - \hat{\mu})^2}{\left[\sum_{k=1}^{nq}(X_k - X_{k-1} - \hat{\mu})^2\right]^2} \quad .$$ It has also been shown in Lo

and MacKinlay (1988) that when q = 2, $VR(q)$ -1 estimates the first-order autocorrelation coefficient of $X_t - X_{t-1}$. Thus, if the X_ts are the log of weekly prices, then $VR(2)$ approximates the first-order autocorrelation of weekly returns.

3. Data and results

Weekly price data for the A-Share and B-Share stocks issued by eighty-six companies are taken from the data bank of the Taiwan Economic Journal. Also taken are the weekly values for the Shanghai A-Share index, the Shanghai B-Share index, the Shenzhen A-Share index, and the Shenzhen B-Share index. First to test is whether the weekly index movements of these indexes follow random walk.

Table 1

Variance ratios for the weekly values of the China indexes and the corresponding z statistics for the null hypothesis that a ratio has a value of 1

SA999   Shanghai A-Share Index   1992/01/03 to 2007/03/30

for q = 2	nq = 768	VR(q) = 1.08	z(q) = 1.14	NOT rejected at 5 %
for q = 4	nq = 768	VR(q) = 1.09	z(q) = 0.72	NOT rejected at 5 %
for q = 8	nq = 768	VR(q) = 1.13	z(q) = 0.74	NOT rejected at 5 %
for q = 16	nq = 768	VR(q) = 1.10	z(q) = 0.43	NOT rejected at 5 %

SB999   Shanghai B-Share Index   1992/02/21 to 2007/01/19

for q = 2	nq = 752	VR(q) = 1.13	z(q) = 2.81	REJECTED at 5%
for q = 4	nq = 752	VR(q) = 1.23	z(q) = 3.6	REJECTED at 5%
for q = 8	nq = 752	VR(q) = 1.46	z(q) = 3.64	REJECTED at 5%
for q = 16	nq = 752	VR(q) = 1.67	z(q) = 3.68	REJECTED at 5%

ZA999   Shenzhen A-Share Index   1992/10/09 to 2007/02/09

for q = 2	nq = 720	VR(q) = 1.05	z(q) = 0.97	NOT rejected at 5 %
for q = 4	nq = 720	VR(q) = 1.08	z(q) = 0.84	NOT rejected at 5 %
for q = 8	nq = 720	VR(q) = 1.10	z(q) = 0.68	NOT rejected at 5 %
for q = 16	nq = 720	VR(q) = 1.08	z(q) = 0.37	NOT rejected at 5 %

ZB999   Shenzhen B-Share Index   1992/10/09 to 2007/02/09

for q = 2	nq = 720	VR(q) = 1.23	z(q) = 2.91	REJECTED at 5%
for q = 4	nq = 720	VR(q) = 1.46	z(q) = 3.3	REJECTED at 5%
for q = 8	nq = 720	VR(q) = 1.58	z(q) = 3.03	REJECTED at 5%
for q = 16	nq = 720	VR(q) = 1.77	z(q) = 3.21	REJECTED at 5%

$$VR(q) \equiv \frac{\overline{\sigma}_c^2(q)}{\overline{\sigma}_a^2}$$, where $\overline{\sigma}_a^2$ is the estimated variance of the weekly differences $X_t - X_{t-1}$, and

$\overline{\sigma}_c^2(q)$ is meant to provide an unbiased estimation of 1/q times the variance of $X_t - X_{t-q}$. Under the random walk null hypothesis, the variance ratio $VR(q)$ is 1, and the test statistic z(q) follows a standard normal distribution asymptotically. The last column tells whether the null hypothesis that $VR(q) = 1$ is rejected at the 5 percent level of significance. nq denotes the number of weekly observation in the series.

For the purpose of this study, in order not to reject the random walk hypothesis for a particular price series, it is required that the four variance ratios calculated of the series, i.e., $VR(2)$, $VR(4)$, $VR(8)$, and $VR(16)$, all have values close enough to. If even one of these ratios' claims to being equal to one is rejected, the random walk is rejected for the price series. Looking at the results of table 1, it is seen that the random walk hypothesis is rejected for the B-Share indexes but not for the A-Share indexes. Also, since $VR(2)$-1 estimates the first order autocorrelation of weekly returns, the autocorrelations for the Shanghai A-Share index and the Shenzhen A-Share index are but a mere 8% and 5%, respectively, while the autocorrelations for the Shanghai B-index and the Shenzhen B-index on the other hand, are 13% and 23%, respectively.

Looking at table 1 again, when the random walk is rejected for an index, all four variance ratios have been found to be sufficiently different from one. Likewise when the random walk is not rejected for an index, all four variance ratios have values close to one. This is strong evidence that the A-Share stocks follow random walk while the B-Share stocks do not.

Testing the indexes has produced very clear-cut results. These results will be strengthened if testing done on individual stock returns produces similar results. To this end, eighty-six companies issuing both the A and B shares have been identified and their A-Share as well as B-Share returns are tested for the random walk. Results are presented in table 2. The A and B shares are presented in pairs.

Presented in table 2 are the names of the stocks together with the magnitudes of the four variance ratios corresponding to q = 2, 4, 8, 16, respectively. Shown next to each ratio is the size of the corresponding z statistic for the unity null, or that the ratio has a value of one. The summary statistics at the end of the table provide for the averages of the autocorrelations for the negatively autocorrelated as well as the non-negatively autocorrelated stocks. As well, the overall averages regardless of the direction of autocorrelation are shown for each class of stocks.

Table 2

Stock name	Sampling period (yy/mm)	VR(2)/z(2)	VR(4)/z(4)	VR(8)/z(8)	VR(16)/z(16)
Accord Pharmaceutical_A	93/08-07/02	1.00/0.01	0.94/-0.79	0.92/-0.58	0.91/-0.45
Accord Pharmaceutical_B	93/08-07/03	1.13/1.68	1.17/1.33	1.10/0.57	1.28/1.21
Auto Instrument_A	94/03-07/01	0.97/-0.61	0.86/-1.29	0.74/-1.48	0.55/-1.8
Auto Instrument_B	94/04-07/02	1.10/1.49	1.20/1.71	1.13/0.75	1.13/0.52
Baoshi_A	96/09-07/03	1.00/0.09	0.99/-0.08	0.91/-0.57	0.70/-1.4
Baoshi_B	96/07-07/03	1.19/2.3*	1.33/2.4*	1.39/1.99*	1.64/2.59*
Baosight Software_A	94/03-07/03	0.91/-1.21	0.81/-1.56	0.69/-1.71	0.50/-2.01*
Baosight Software_B	94/03-07/03	1.12/2.1*	1.29/2.87*	1.39/2.59*	1.57/2.74*
Beijing Orient_A	01/01-07/03	1.06/1.0	1.08/0.7	0.93/-0.41	0.79/-0.81
Beijing Orient_B	97/06-07/01	1.15/2.0*	1.35/2.67*	1.42/2.25*	1.50/1.96*
Bengang Steel Plates_A	98/01-07/04	0.99/-0.22	0.95/-0.47	0.93/-0.43	0.93/-0.28
Bengang Steel Plates_B	97/07-07/03	1.13/1.35	1.31/1.94	1.27/1.22	1.41/1.46
Changan Automobile_A	97/06-07/02	1.11/1.92	1.26/2.61*	1.44/2.82*	1.58/2.59*
Changan Automobile_B	96/11-07/02	1.16/1.86	1.28/1.87	1.31/1.48	1.37/1.41
Changyu_A	00/10-06/12	0.90/-1.01	0.89/-0.65	0.89/-0.46	0.98/-0.07
Changyu_B	97/09-07/01	1.11/1.38	1.22/1.66	1.14/0.76	1.21/0.86
Chenming Paper_A	00/11-07/02	1.03/0.53	1.06/0.61	1.03/0.2	0.94/-0.24
Chenming Paper_B	97/05-07/01	1.07/1.19	1.22/2.03*	1.23/1.45	1.28/1.3
China Containers Group_A	94/04-07/03	0.98/-0.34	1.05/0.54	1.07/0.5	0.91/-0.45
China Containers Group_B	94/03-07/03	1.08/1.6	1.22/2.39*	1.34/2.46*	1.34/1.71
China Textile_A	92/08-07/04	0.97/-0.39	0.78/-1.36	0.66/-1.44	0.58/-1.4
China Textile_B	92/07-07/01	1.06/1.79	1.11/2.06*	1.04/0.44	1.06/0.38
Chlor-Alkali Chemical_A	92/11-07/04	0.93/-0.61	0.72/-1.42	0.52/-1.8	0.39/-1.93
Chlor-Alkali Chemical_B	92/08-07/03	1.07/2.35*	1.10/1.77	1.01/0.06	1.05/0.28
CSG Holding_A	92/02-07/03	1.08/1.51	1.16/1.84	1.37/2.75*	1.39/2.04*
CSG Holding_B	92/02-07/03	1.18/2.91*	1.36/3.37*	1.47/3.1*	1.55/2.73*
Dadonghai_A	97/01-06/09	1.08/1.38	1.17/1.67	1.05/0.3	0.87/-0.58
Dadonghai_B	96/10-06/12	1.26/2.53*	1.45/2.34*	1.27/0.99	1.15/0.44
Dajiang Co._A	93/11-07/02	0.98/-0.36	0.91/-0.92	0.82/-1.15	0.66/-1.56
Dajiang Co._B	93/12-07/01	1.10/1.83	1.25/2.56*	1.25/1.7	1.43/2.08*
Dalian Refrigeration Co._A	93/12-07/02	0.97/-0.45	0.97/-0.24	1.09/0.53	1.28/1.19
Dalian Refrigeration Co._B	98/03-07/03	1.10/1.09	1.35/2.27*	1.41/1.88	1.56/1.91
Daying Co._A	94/03-07/01	0.99/-0.2	0.97/-0.31	0.91/-0.53	0.86/-0.58
Daying Co._B	93/12-07/03	1.10/1.74	1.14/1.4	1.13/0.82	1.27/1.19
Dazhong Transportion_A	92/08-07/01	0.97/-0.42	0.84/-1.08	0.76/-1.06	0.63/-1.25
Dazhong Transportion_B	92/07-07/03	1.00/0.08	1.02/0.43	0.96/-0.61	0.82/-1.47
Dingli Co._A	92/08-07/03	0.96/-0.75	0.78/-1.44	0.65/-1.57	0.56/-1.52
Dingli Co._B	92/07-07/01	1.04/1.66	1.07/1.58	1.00/-0.03	1.06/0.39
Eastern Communications_A	96/11-07/03	1.02/0.42	0.94/-0.54	1.01/0.03	0.91/-0.32
Eastern Communications_B	96/08-07/03	0.97/-0.67	0.89/-1.1	0.93/-0.43	1.04/0.16
Eerduosi_A	01/04-07/03	1.07/1.11	1.08/0.77	1.08/0.51	1.06/0.26
Eerduosi_B	95/10-06/12	1.08/1.31	1.16/1.45	1.21/1.31	1.41/1.85
Erfangji_A	92/04-06/12	0.97/-0.48	0.85/-1.08	0.73/-1.37	0.56/-1.74
Erfangji_B	92/07-07/02	1.04/2.15*	1.10/2.59*	1.03/0.38	1.02/0.12
Fangda Group_A	96/04-07/03	1.03/0.52	1.04/0.45	0.95/-0.38	0.83/-0.83
Fangda Group_B	95/12-07/02	1.10/1.76	1.15/1.53	1.14/0.9	1.29/1.32
First Pencil_A	92/08-07/01	0.96/-0.58	0.76/-1.35	0.70/-1.15	0.66/-1.01

First Pencil_B	92/07-06/12	1.03/1.41	1.07/2.11*	1.05/0.66	1.08/0.63
Fiyta_A	93/06-07/03	1.01/0.13	0.98/-0.21	0.91/-0.59	0.74/-1.2
Fiyta_B	93/06-07/01	1.10/1.97*	1.14/1.46	1.10/0.72	1.12/0.58
Foshan Lighting_A	93/11-07/03	0.88/-1.83	0.83/-1.46	0.90/-0.57	0.93/-0.32
Foshan Lighting_B	95/08-06/12	1.01/0.16	1.11/0.87	1.17/0.95	1.23/0.96
Friendship Co._A	94/02-06/12	0.94/-0.63	0.85/-0.98	0.82/-0.83	0.69/-1.08
Friendship Co._B	94/01-07/03	1.08/1.48	1.16/1.78	1.26/1.87	1.31/1.53
Guandong Expressway_A	98/02-07/04	0.99/-0.15	1.11/1.15	1.23/1.66	1.30/1.48
Guandong Expressway_B	96/08-07/03	1.14/1.75	1.21/1.57	1.24/1.24	1.27/1.07
Guangdong Electric Power_A	93/11-07/02	0.99/-0.42	0.96/-0.53	1.07/0.61	1.26/1.52
Guangdong Electric Power_B	95/06-06/12	1.01/0.23	1.06/0.59	1.13/0.84	1.22/1.03
Gujing Distillery_A	96/09-06/11	1.03/0.42	1.07/0.5	1.07/0.34	0.88/-0.44
Gujing Distillery_B	96/06-06/10	1.20/2.68*	1.45/3.57*	1.64/3.57*	1.82/3.42*
Hainan Airlines_A	99/11-07/03	1.05/0.58	1.09/0.59	1.07/0.34	1.02/0.07
Hainan Airlines_B	97/06-07/02	1.04/0.84	1.08/0.82	1.08/0.49	1.10/0.41
Haixin Co._A	94/04-07/03	1.00/0.05	1.03/0.28	1.07/0.5	0.83/-0.82
Haixin Co._B	93/12-07/03	1.10/2.24*	1.27/3.19*	1.45/3.35*	1.48/2.47*
Highly Co._A	92/11-06/12	1.03/0.7	1.03/0.31	1.12/0.82	1.03/0.15
Highly Co._B	93/01-07/01	1.04/1.69	1.11/2.64*	1.13/1.86	1.02/0.14
Huadian Energy_A	96/07-07/03	0.95/-1.08	0.93/-0.76	0.88/-0.87	0.90/-0.48
Huadian Energy_B	96/04-07/03	1.02/0.38	1.09/0.86	1.10/0.63	1.26/1.16
Huangshan Tourism_A	97/05-07/01	1.00/0.1	1.06/0.7	0.98/-0.11	0.75/-1.21
Huangshan Tourism_B	96/11-07/02	1.08/1.69	1.10/1.02	1.18/1.22	1.32/1.49
Huaxin Cement_A	94/01-07/03	0.99/-0.15	0.89/-1.24	0.87/-0.94	0.87/-0.57
Huaxin Cement_B	94/12-07/03	1.07/1.44	1.18/2.13*	1.32/2.37*	1.54/2.74*
Jiangling Motors_A	93/12-07/03	1.02/0.34	0.96/-0.31	0.98/-0.11	0.91/-0.37
Jiangling Motors_B	95/09-07/01	1.09/1.15	1.12/0.87	1.05/0.24	1.13/0.5
Jiangsu Changchai_A	94/07-07/01	1.02/0.37	0.93/-0.55	0.90/-0.51	0.70/-1.12
Jiangsu Changchai_B	96/09-07/04	1.11/1.97*	1.27/2.63*	1.36/2.36*	1.55/2.62*
Jin Jiang Investment_A	93/06-07/04	0.88/-1.6	0.80/-1.51	0.81/-0.98	0.70/-1.11
Jin Jiang Investment_B	93/10-07/03	0.97/-0.52	1.02/0.2	1.04/0.28	1.15/0.73
Jinan Qingqi_A	93/12-07/01	1.07/1.73	1.08/0.95	1.06/0.42	0.96/-0.16
Jinan Qingqi_B	97/06-07/02	1.17/2.77*	1.36/3.24*	1.42/2.48*	1.60/2.5*
Jinjiang Co._A	96/10-07/03	0.94/-1.34	0.91/-1.07	0.87/-0.96	0.72/-1.38
Jinjiang Co._B	94/12-07/02	0.98/-0.42	1.01/0.08	0.99/-0.03	1.10/0.45
Jinshan Development_A	93/10-07/04	0.96/-0.61	0.94/-0.61	0.90/-0.62	0.83/-0.77
Jinshan Development_B	93/11-06/12	1.08/1.37	1.17/1.74	1.16/1.13	1.33/1.7
Jinzhou Port_A	99/06-07/03	1.00/-0.09	0.90/-0.95	0.84/-0.9	0.71/-1.16
Jinzhou Port_B	98/05-07/01	1.02/0.27	1.07/0.64	1.18/1.08	1.29/1.14
Kaikai Industrial_A	01/03-06/11	1.06/0.81	1.16/1.21	1.13/0.61	1.12/0.39
Kaikai Industrial_B	97/01-07/01	1.09/1.58	1.27/2.46*	1.27/1.65	1.43/1.91
Lian Hua Fibre_A	92/10-07/03	0.97/-0.55	0.82/-1.56	0.73/-1.48	0.41/-2.41*
Lian Hua Fibre_B	93/09-06/12	1.07/0.97	1.18/1.45	1.26/1.58	1.45/2.09*
Little Swan_A	97/03-07/03	1.02/0.4	1.09/0.98	1.01/0.03	0.82/-0.85
Little Swan_B	96/07-07/02	1.11/1.64	1.25/2.15*	1.33/1.85	1.43/1.74
Livzon Group_A	93/10-07/02	1.04/0.73	1.01/0.14	0.97/-0.21	0.97/-0.14
Livzon Group_B	93/07-07/03	1.12/1.65	1.24/1.79	1.24/1.33	1.43/1.81
Lu Thai_A	00/12-07/03	0.92/-1.1	0.86/-1.12	0.85/-0.86	0.81/-0.79
Lu Thai_B	97/08-07/03	1.07/0.93	1.25/1.84	1.38/2.01*	1.49/1.92
Lujiazui_A	93/07-06/12	1.04/0.72	1.07/0.71	0.99/-0.06	0.89/-0.48
Lujiazui_B	94/11-07/01	1.06/0.88	1.08/0.65	1.13/0.76	1.17/0.7

Meiling_A	93/10-06/11	0.98/-0.41	0.91/-0.92	0.93/-0.45	0.93/-0.33
Meiling_B	96/08-07/03	1.10/1.4	1.21/1.67	1.23/1.27	1.25/1.05
Merchants Property_A	93/06-07/04	1.05/0.76	0.98/-0.15	0.95/-0.35	0.91/-0.43
Merchants Property_B	93/06-07/01	1.08/1.3	1.13/1.16	1.12/0.75	1.29/1.32
Nine Dragon_A	01/03-07/02	0.97/-0.34	0.97/-0.25	0.91/-0.43	0.93/-0.23
Nine Dragon_B	99/01-07/02	1.13/1.21	1.26/1.51	1.28/1.1	1.35/1.07
Pearl River Holdings_A	92/12-07/02	1.07/1.48	1.11/1.43	1.08/0.67	0.87/-0.63
Pearl River Holdings_B	95/06-07/03	1.07/0.72	1.19/1.21	1.21/1.01	1.33/1.28
Pudong Jinqiao_A	93/03-07/01	1.07/1.52	1.04/0.41	0.88/-0.83	0.67/-1.6
Pudong Jinqiao_B	93/06-07/02	1.08/1.63	1.13/1.54	1.27/2.02*	1.44/2.26*
Sanonda_A	93/12-07/02	0.98/-0.54	0.99/-0.09	1.00/-0.03	1.05/0.24
Sanonda_B	97/05-06/12	1.12/1.76	1.27/2.23*	1.24/1.39	1.44/1.85
SGSB_A	94/03-07/01	0.97/-0.59	0.86/-1.35	0.79/-1.31	0.62/-1.66
SGSB_B	94/01-07/03	1.08/1.53	1.24/2.43*	1.33/2.24*	1.50/2.4*
SH Mechanical & Electrical_A	94/02-07/01	1.01/0.23	0.92/-0.75	0.84/-0.93	0.71/-1.2
SH Mechanical & Electrical_B	94/02-07/03	1.07/1.34	1.14/1.4	1.21/1.37	1.25/1.16
Shanghai Diesel Co._A	94/03-07/01	0.90/-1.51	0.82/-1.53	0.75/-1.34	0.59/-1.51
Shanghai Diesel Co._B	93/12-07/02	1.08/1.56	1.19/2.02*	1.27/1.89	1.35/1.71
Shanghai Forever_A	94/01-07/03	1.02/0.36	1.02/0.19	0.95/-0.32	0.78/-1.04
Shanghai Forever_B	93/11-07/03	1.02/0.46	1.07/0.7	0.99/-0.08	1.03/0.17
Shanghai Material Trading_A	94/02-06/12	0.99/-0.19	0.90/-0.91	0.82/-1.01	0.59/-1.69
Shanghai Material Trading_B	94/04-07/03	1.08/1.49	1.21/2.19*	1.23/1.64	1.36/1.84
Shanghai Potevio_A	93/10-07/01	0.99/-0.19	0.90/-0.94	0.82/-1.09	0.69/-1.36
Shanghai Potevio_B	94/10-07/03	1.08/1.13	1.05/0.35	0.95/-0.29	0.96/-0.17
Shanghai Sanmao_A	93/11-07/01	1.05/0.64	1.00/0.0	0.87/-0.67	0.63/-1.43
Shanghai Sanmao_B	94/01-07/02	1.09/1.79	1.18/1.83	1.23/1.54	1.33/1.49
Shenzhen China_A	92/04-06/11	1.10/2.55*	1.15/1.92	1.02/0.12	0.85/-0.83
Shenzhen China_B	92/04-07/01	1.12/2.37*	1.21/2.13*	1.15/1.03	1.27/1.4
Shenzhen Chiwan_A	93/05-07/04	1.02/0.47	1.00/-0.04	0.96/-0.31	0.92/-0.39
Shenzhen Chiwan_B	93/05-07/03	1.08/1.14	1.14/1.13	1.09/0.56	1.27/1.2
Shenzhen Huafa_A	92/04-06/08	1.00/-0.01	0.99/-0.11	0.99/-0.08	0.87/-0.7
Shenzhen Huafa_B	92/04-07/02	1.22/3.2*	1.37/3.06*	1.29/1.76	1.31/1.45
Shenzhen Konka_A	92/03-06/12	1.01/0.33	1.06/0.75	1.12/0.97	1.14/0.72
Shenzhen Konka_B	92/03-07/04	0.63/-0.94	0.47/-0.9	0.38/-0.89	0.31/-0.92
Shenzhen Nanshan Power Stati_A	94/07-07/02	1.09/1.85	1.10/1.23	1.03/0.23	0.81/-0.92
Shenzhen Nanshan Power Stati_B	94/12-07/02	1.14/1.85	1.32/2.34*	1.39/2.08*	1.43/1.77
Shenzhen Properties_A	92/04-06/12	1.04/0.78	1.06/0.65	0.97/-0.19	0.89/-0.57
Shenzhen Properties_B	92/04-07/03	1.15/2.72*	1.24/2.51*	1.22/1.51	1.29/1.44
Shenzhen Real Estate_A	93/09-07/03	1.00/-0.06	1.04/0.39	1.01/0.05	0.95/-0.24
Shenzhen Real Estate_B	94/01-07/03	1.13/1.87	1.28/2.31*	1.21/1.27	1.40/1.78
Shenzhen SEG_A	96/12-07/01	0.96/-0.57	0.89/-0.84	0.88/-0.69	0.79/-0.83
Shenzhen SEG_B	96/07-07/02	1.18/2.51*	1.30/2.46*	1.33/1.8	1.45/1.89
Shenzhen Shenbao_A	92/10-07/03	1.06/1.33	1.07/0.8	1.06/0.42	0.88/-0.59
Shenzhen Shenbao_B	92/10-07/04	1.04/0.69	1.08/0.75	1.05/0.34	1.07/0.34
Shenzhen Tellus_A	93/06-07/04	1.02/0.36	0.99/-0.17	0.92/-0.65	0.73/-1.38
Shenzhen Tellus_B	93/06-06/12	0.99/-0.1	0.97/-0.15	0.89/-0.51	0.85/-0.58
Shenzhen Textile_A	94/08-07/03	1.00/0.03	0.95/-0.52	0.88/-0.89	0.76/-1.28
Shenzhen Textile_B	94/08-07/03	1.09/1.22	1.06/0.41	0.86/-0.75	0.90/-0.41
Shenzhen Victor Onward_A	92/06-07/01	0.99/-0.2	0.99/-0.11	0.91/-0.6	0.72/-1.37
Shenzhen Victor Onward_B	92/06-07/03	1.01/0.14	0.97/-0.19	0.90/-0.49	0.94/-0.24
Sunrise Co._A	93/10-06/11	1.07/1.48	1.07/0.85	1.03/0.21	0.97/-0.17
Sunrise Co._B	93/10-06/12	1.08/1.13	1.13/1.06	1.12/0.69	1.27/1.2

		VR(2)/z(2)	VR(4)/z(4)	VR(8)/z(8)	VR(16)/z(16)
Sva Electron_A	92/01-07/01	0.90/-0.76	0.86/-0.71	0.89/-0.47	0.92/-0.29
Sva Electron_B	92/02-07/01	1.01/0.69	1.01/0.83	1.01/0.27	1.06/0.6
SZ International Enterprise_A	96/07-07/03	0.92/-1.48	0.94/-0.62	0.86/-0.89	0.69/-1.44
SZ International Enterprise_B	95/11-07/01	1.13/1.77	1.23/1.75	1.17/0.89	1.36/1.45
Tianjin Marine Shipping_A	96/09-07/03	0.93/-1.08	0.82/-1.57	0.73/-1.68	0.64/-1.53
Tianjin Marine Shipping_B	96/05-07/03	1.05/0.95	1.06/0.55	1.15/0.85	1.24/0.95
Tyre & Rubber_A	92/12-07/01	0.71/-12.97*	0.54/-10.63*	0.42/-6.73*	0.33/-4.92*
Tyre & Rubber_B	92/08-07/04	1.07/3.01*	1.13/2.91*	1.08/1.0	1.03/0.24
Vanke_A	92/01-07/01	1.03/0.87	1.09/1.31	1.16/1.3	1.11/0.58
Vanke_B	93/05-07/03	1.05/1.09	1.11/1.31	1.18/1.37	1.26/1.43
Wai Gaoqiao_A	93/05-07/03	0.94/-0.89	0.90/-0.87	0.71/-1.66	0.53/-1.97*
Wai Gaoqiao_B	93/07-07/04	1.05/1.16	1.08/0.9	1.17/1.28	1.33/1.7
Weifu Hi-Tech_A	98/09-07/03	0.98/-0.32	1.01/0.14	1.16/0.99	1.29/1.21
Weifu Hi-Tech_B	95/09-07/01	1.07/1.05	1.11/0.9	1.16/0.93	1.25/1.08
Wingsung Data_A	92/08-07/03	0.97/-0.46	0.80/-1.18	0.68/-1.31	0.64/-1.15
Wingsung Data_B	92/07-07/02	1.03/0.66	1.05/0.64	0.98/-0.21	0.98/-0.12
Worldbost Co._A	97/07-06/10	0.96/-0.59	0.99/-0.09	0.92/-0.41	0.84/-0.66
Worldbost Co._B	96/07-07/02	1.02/0.25	1.09/0.7	1.11/0.62	1.14/0.56
Yaohua Pilkington Glass_A	94/01-07/01	1.00/-0.08	1.02/0.19	0.99/-0.09	0.81/-0.81
Yaohua Pilkington Glass_B	93/12-07/01	1.04/0.71	1.14/1.52	1.33/2.33*	1.53/2.59*
Zhenhua Port Machinery_A	00/12-07/03	0.94/-1.08	0.93/-0.63	1.05/0.3	1.03/0.11
Zhenhua Port Machinery_B	97/08-07/03	1.05/1.01	1.14/1.42	1.26/1.73	1.34/1.54

For the A shares: For the B shares:

Average autocorrelation = -0.006   Average autocorrelation = 0.078
Standard deviation = 0.06   Standard deviation = 0.074

Average non-negative autocorrelation = 0.041   Average non-negative autocorrelation = 0.089
Standard deviation = 0.029   Standard deviation = 0.051

Average negative autocorrelation = -0.046   Average negative autocorrelation = -0.095
Standard deviation = 0.049   Standard deviation = 0.155

Number of stocks rejected   Number of stocks rejected
for the random walk = 7   for the random walk = 37

$$VR(q) \equiv \frac{\overline{\sigma}_c^2(q)}{\overline{\sigma}_a^2}$$, where $\overline{\sigma}_a^2$ is the estimated variance of the weekly differences $X_t - X_{t-1}$, and

$\overline{\sigma}_c^2(q)$ is meant to provide an unbiased estimation of 1/q times the variance of $X_t - X_{t-q}$. Under the

random walk null hypothesis, the variance ratio $VR(q)$ is 1, and the test statistic z(q) follows a standard normal

distribution asymptotically. Thus, the entries under the column heading VR(2)/z(2) is the ratio of the estimated

variance of the weekly difference $X_t - X_{t-1}$ to 1/q times the variance of $X_t - X_{t-2}$ juxtaposed with the

the corresponding z statistic. Rejection of the null hypothesis that VR(q) is 1 is indicated by an asterisk next to

z(q). If at least one of the VR(q)s for a certain stock has been rejected for the unity null, that stock is rejected for

the random walk.

Of the eighty-six B-Share stocks presented in table 2, thirty seven of them rejected
the random walk. This contrasts sharply with the mere seven rejections out of eighty
six for the A-Share stocks. Additionally, for those B-Share stocks that are shown to
exhibit non-negative autocorrelations in their weekly returns, the average value of the

correlation (8.9%) is more than twice that of the A-Shares stocks (4.1%). Similarly, for the B-Share stocks that are negatively autocorrelated, the average correlation (-9.5%) is again more than twice that of the A-Share stocks (-4.6%). Overall, results for the individual stocks corroborate those for the indexes. Namely, that B-Share stocks strongly reject the random walk while the A-Share stocks seemingly follow the random walk. Of note is the fact that in this study, the A-Shares stocks and the B-Share stocks are issued by the same companies, therefore, the discrepancy with regard the random walk in a pair of A-Share and B-Share stocks issued by a company cannot be due to a discrepancy in investors' perception of the company's future. Some other factors are at work.

4. Conclusions

Applying the Lo and MacKinlay variance ratio test onto the weekly returns from the Shanghai A-Share index, the Shanghai B-Share index, the Shenzehen A-Share index, and the Shenzhen B-Share index, it is found that the B-Shares indexes strongly reject the random walk while no rejection of the random walk is found for the A-Share indexes. Moreover, applying the same variance ratio test onto individual weekly stock returns from eighty-six companies issuing both the A and B shares, it is found that more than five times as many B shares reject the random walk as do the B shares. These results strongly suggest that the China A shares follow a random walk but the B shares do not.

Of note is the fact that since the A and B shares in this study are issued by the same companies, any discrepancy between a pair of A and B shares issued by the same company must not be due to investor expectation with regard to the company's future prospects. Lima and Tabak (2004) suggest that liquidity and market capitalization issues may induce smaller markets to reject the random walk. Admittedly, on both the Shanghai and Shenzhen exchanges, the A shares outweigh the B shares in no small terms in terms of total market capitalization[1]; however, since these two classes of stocks are basically invested in by investors of two distinct backgrounds, i.e., Chinese nationals versus non-Chinese nationals, behavioral differences inherent in the two investing populations may play an important role in the discrepant results.

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[1] As of November 2005, the figures provided by the Taiwan Economic Journal data bank were that the market capitalizations of the Shanghai A shares and the Shenzhen A shares were 2186 billion RMB and 863 billion RMB, respectively, while those for the Shanghai B shares and the Shenzhen B shares were 24 billion USD and 5 billion USD, respectively.

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