“Joint variance-ratio tests of random walks in China's closed-end fund market”

AUTHORS	Emmanuel Anoruo Uchenna Elike

ARTICLE INFO	Emmanuel Anoruo and Uchenna Elike (2008). Joint variance-ratio tests of random walks in China's closed-end fund market. *Investment Management and Financial Innovations*, *5*(2)
RELEASED ON	Thursday, 26 June 2008
JOURNAL	"Investment Management and Financial Innovations"
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”

NUMBER OF REFERENCES
0

NUMBER OF FIGURES
0

NUMBER OF TABLES
0

Emmanuel Anoruo (USA), Uchenna Elike (USA)

Joint variance-ratio tests of random walks in China's closed-end fund market

Abstract

This paper examines the random walk behavior of four China's non-US equity closed-end funds including Greater China Fund (GCH), China Fund (CHN), Jardine Fleming China Region Fund (JFC), and Taiwan Greater China Fund (TFC) using joint variance ratio tests. The results from the joint variance ratio procedures reveal that the null hypothesis that the closed-end fund returns follow random walk should be rejected in all of the cases. From these results it is inferred that the four China's closed-end funds under consideration do not exhibit random walk behavior for the sample period. The implication of the results is that the weak-form market efficiency hypothesis does not hold for the four China's closed-end funds market.

Keywords: variance ratio, closed-end funds; random walks, discount, premium.
JEL Classification: F36, G15.

Introduction

The markets for closed-end funds have gained popularity over the past decade. Closed-end funds provide investors with unique and convenient avenues to diversify their portfolios internationally at minimal transaction costs. In addition, the existence of closed-end funds markets eliminates the need for foreign exchange for settlement purposes. The understanding of whether the closed-end fund markets are efficient or not is important especially to investors who seek to exploit the opportunities created by inefficiencies in such markets. If the closed-end markets were efficient, shocks to returns would be permanent. This implies that future movements in closed-end returns cannot be forecasted using past information. However, if closed-end fund markets were inefficient, then future movements in the closed-end market returns can be predicted using past information.

The random walk behavior of financial time series such as exchange rates, interest rates, and stock market returns has been tested in the literature. For instance, Wright (2000) applied the ranks and signs tests and found that exchange rate returns do not follow random walk for the United States. However, Belaire-Franch and Opong (2005) using the non-parametric variance-ratio tests find evidence in support of the hypothesis that Euro exchange rate returns exhibit random walk behavior. Meese and Singleton (1982) and Baillie and Bollerslev (1989) maintain that exchange rates are unit root processes with non-mean reverting. Similarly, Giddy and Dufey (1975), Cornell and Dietrich (1978), Logue et al. (1988) and Hsieh (1988) suggest that increments in exchange rates are uncorrelated. Lo and MacKinlay (1988) investigated the random walk behavior of stock returns. Liu and He (1991) examined the hypothesis that exchange rates follow random order. Their results rejected the random walk hypothesis for nominal exchange rates. Ayadi and Pyun (1994) using the variance ratio test rejected the random walk hypothesis for the Korean stock market prices. Chou et al. (1996) examined the random walk behavior of interest rates for eight world currencies. Their results reveal that most of the interest rates studied do not exhibit random walk behavior in short run. However, their results also suggested that most of the interest rate series under study were random walk processes in the long run.

From the literature it is evident that the random walk behavior of exchange rates, interest rates, and stock market returns has been examined. However, the random walk behavior of closed-end fund returns has not been accorded attention in the literature. This paper fills this void by investigating the random walk behavior of four China's non-US equity closed-end funds including Greater China Fund (GCH), China Fund (CHN), Jardine Fleming China Region Fund (JFC), and Taiwan Greater China Fund (TFC) using variance ratio tests. Precisely, the paper uses the Chow and Denning (1993) and Whang and Kim (2005) joint variance procedures to determine whether the returns for the closed-end funds follow random order.

The purpose of this study is to investigate the random walk behavior of four China's non-US equity closed-end funds including Greater China Fund (GCH), China Fund (CHN), Jardine Fleming China Region Fund (JFC), and Taiwan Greater China Fund (TFC) using variance ratio tests. Precisely, the paper uses the Chow and Denning (1993) and Whang and Kim (2005) joint variance procedures to ascertain whether the four closed-end funds are walk processes.

The remainder of the study is structured as follows. Following the introduction, section 1 provides the

methodology of the study. Section 2 presents the data and the descriptive statistics for the four closed-end funds. Section 3 discusses the empirical results. The last section furnishes the summary of the findings and the implications of the study.

1. Methodology

This section details the procedures applied by the study. The Chow and Denning (1993) and Whang and Kim (2005) joint variance tests were implemented to examine random walk behavior for the China's non-US equity closed-end funds including Greater China Fund (GCH), China Fund (CHN), Jardine Fleming China Region Fund (JFC), and Taiwan Greater China Fund (TFC).

1.1. Chow-Denning test. The Chow and Denning (1993) (CD) multiple variance ratio framework involves jointly testing the null hypothesis that $V(ki) = 1$ for $i = 1, \ldots, l$; against the alternative that $V(ki) \neq 1$ for a given holding period such as ki. The CD test statistic is derived from

$$MV = \frac{\max}{tsset} \left| M(x; ki) \right|. \quad (1)$$

The test statistic for the CD procedure is based on the studentized maximum modulus distribution with l and T degrees of freedom. The null hypothesis is rejected if the computed test statistic exceeds the critical value provided by Stoline and Ury (1979) at the conventional levels.

1.2. Joint sign test. Whang and Kim (2003) builds on Wrights (2000) individual variance ratio tests to joint tests. The tests involve the selection of the maximum absolute value of the test statistic. The joint variance ratio tests proposed by Whang and Kim begin by calculating the $Ri(q)$ for m different values of q and the maximum absolute value of the test statistic selected, as given in equation (2):

$$JR1 = max \left| R1(q_i) \right|. \quad (2)$$

The test statistic JR_1 has exact sampling distribution and finite sample properties. The critical values for the joint variance ratio tests are provided by Kim (2005):

$$JR2 = max \left| R2(q_i) \right|, \quad (3)$$

and

$$JS1 = max \left| S2(q_i) \right|. \quad (4)$$

In addition, the study implements the bootstrap joint variance ratio test proposed by Kim (2006). The bootstrap procedure is based on the Chow and Denning (1993) joint variance ratio tests. It involves selecting the maximum absolute value from a set of m test statistic. The CD test is based on the following equation:

$$JM2 = \max \left| M2(q_i) \right|. \quad (5)$$

Kim (2006) suggests that the wild bootstrap procedure should be used to approximate the unknown sampling distribution of the test (i.e., JM_2). The details of the wild bootstrap joint variance ratio procedures can be found in Kim (2006).

2. Data and summary statistics

The paper uses monthly data on share price and net asset value (NAV) to construct returns for four China's non-US equity closed-end funds including Greater China Fund (GCH), China Fund (CHN), Jardine Fleming China Region Fund (JFC), and Taiwan Greater China Fund (TFC). Let PR_t represent the share price and NAV_t stands for net asset value at time t. Then the return series is given by $R = ((PR_t/NAV_t)\text{-}1)\cdot 100$ for each of the four funds. The sample period covers May 1989-May 2007. The data were obtained from the Nuveen Investments website at http://www.etfconnect.com.

Table 1 displays the summary statistics for the returns for the closed-end funds including GCH, GCH, JFC, and TFC. The mean returns for the four funds are all negative. The CHN fund posted the lowest negative return (-4.44 percent), while JFC fund recorded the highest negative return (11.20 percent). From the maximum and minimum values it can be seen that the closed-end fund markets are subject to wide swings in returns. For example, in the case of CHN the return fluctuated from a maximum of 55.67 percent to a minimum of -30.37 percent. The returns for the other three funds exhibit similar fluctuations. The return for CHN exhibited the highest standard deviation (16.28%) while TCF displayed the lowest (10.30%) dispersion from the mean.

The skewness and the Kurtosis tests were undertaken to ascertain whether the returns for the four closed-end funds are normally distributed. The skewness for all of the four funds is positive. The positive skewness suggests that the returns for the funds are flatter to the right compared to the normal distribution. The Kurtosis reported for all the funds been statistically significant at the 5 percent level. The statistically significant Kurtosis implies the return series for the closed-ends are not normally distributed. In all, Kurtosis test statistics suggest that the distributions for the returns have sharp peaks compared to normal distribution. The Jarque-Bera test statistics displayed in Table 1 suggest that the null hypothesis that the returns for the funds are normally distributed should be rejected at the 1 percent level of significance.

Figures 1-4 plot the returns for the four closed-end funds. It is evident from the graphs that the returns for the closed-end funds are subject to wide swings. In all cases, the degree of volatility in returns for the four closed-end funds, are pronounced throughout the period under study. From Figure 1 it can be observed that the largest return of about 56 percent was recorded in 2004 for CHN fund. The lowest return of roughly -30 percent for CHN fund was recorded in 1998. Figure 2 reveals that the GCH fund recorded the largest return of roughly 29 percent in 2006, while the lowest return of about -32 percent was recorded in 1998. Figure 3 displays the return for the JFC fund. The graph shows that the JFC fund posted the highest return of about 30 percent in 2004 while the lowest return of roughly -38 percent was recorded in 1998. Figures 1-3 indicate that the CHN, GCH, and JFC funds posted negative returns between 1996 and 2003. Finally, Figure 4 plots the return for the TFC fund. From the graph it can be seen that the TFC fund was in the positive territory for most of the period between 1989 and 1995. However, between 1996 and 2007, the return for the fund remained in the negative territory.

3. Empirical results

The empirical results of the study are discussed in this section. Prior to implementing the joint variance ratio, the study applied the conventional procedures proposed by Lo and MacKinlay (1988) and Wright (2000). Table 2 presents the various variance ratio test results. The test statistics labeled M1, M2, R1, R2, and S1 represent results from the variance ratio procedures proposed by Lo and MacKinlay (1988) and Wright (2000). The various variance tests were conducted with different lag lengths (i.e. K = 2, 4, 6, and 8). The M1 and M2 test results presented in columns 2 and 3 of Table 2 suggest that the null hypothesis that the returns for the closed-end funds including CHN, GCH, JFC, and TFC have a value of 1 should be rejected at least at the 5 percent level of significance.

Columns 4 and 5 of Table 2 display the results obtained from the rank-based variance ratio tests including R1 and R2. The results suggest that the null hypothesis that the returns for CHN, GCH, JFC, and TFC follow random walks should be rejected at least at the 5 percent level of significance in all cases. These results are consistent with those obtained from the conventional variance ratio tests of Lo and MacKinlay (1988). Again, these results imply that the returns for CHN, GCH, JFC, and TFC are not in random order. The results from the sign-based variance ratio tests (S1) are presented in column 6 of Table 2. The results from the sign-based test reject the null hypothesis that the return series follow random walks should be rejected at least at the 5 percent significance level in all cases. The results from the conventional variance ratio tests and the non-parametric variance ratio procedures suggest that the return series for the closed-end funds are not random walk processes. These results indicate that the series are not mean-reverting since the computed test statistics are different from 1 at the conventional levels. In addition, the finding that the returns for CHN, GCH, JFC, and TFC are not in random order suggests that the stocks to the series are temporary. This finding also implies that future movements in foreign exchange returns cannot be predicted based on their past behavior.

Table 3 reports the results from the various joint variance ratio tests including the CD1, CD2, JR1, JR2, and JS1. Columns 1 and 2 display the joint variance ratio tests based on the Lo and MacKinlay (1988). These tests are designed to test the existence of iid random walk hypothesis. Columns 3-6 of Table 3 report the results from the martingale difference sequence (mds) procedures represented by JR1, JR2, and JS1. The mds tend to be less restrictive, heteroscedastic random walk procedures. The test statistics provided by the iid procedures including the CD1 and CD2 indicate that the null hypothesis that the returns for the closed-end funds are random walk processes should be rejected at the 1 percent level of significance. This finding is consistent with those provided by the individual variance ratio tests. Turning next to the results from the mds test procedures, it can be seen that the test statistics are all statistically significant at the 1 percent level of significance. The fact that the test statistics are statistically significant that the returns for CHN, GCH, JFC, and TFC are not walk processes. This implies that future returns for the four closed-end funds cannot be predicted using past information.

To check the robustness of the results obtained from the various variance ratio tests, the study next implements the runs test. Table 4 displays the results of the runs test for the closed-end fund returns. In all cases, the actual number of runs (*R*) for each fund is less than the expected number of runs under the null hypothesis of independence. From the results it can be seen that the number of runs below [K(-1)] the mean exceed those above [K(+1)] it. For instance, the runs below the mean (4.40) for CHN fund are 90 while those above the mean are 86. Similar results are indicated for the rest of the funds. In other words, negative runs account for at least 52 percent of the total runs of the 179 data points, while positive runs account for 48 percent. In all cases, the runs test statistics reveal that the successive returns for the four funds are not

independent at the 1% significance level, as indicated by the reported *p*-values. The results from the runs test corroborate those obtained from the various joint variance ratios. From these results, the weak form market efficiency hypothesis is rejected for the four China's closed-end funds.

Summary and implications

This paper has tested the random walk hypothesis for the returns for four China's closed-end funds namely ─ Greater China Fund (GCH), China Fund (CHN), Jardine Fleming China Region Fund (JFC), and Taiwan Greater China Fund (TFC). In particular, the study applies a battery of joint variance ratio frameworks including those proposed by Kim (2006), Chow and Denning (1993), and Whang and Kim (2003) to the returns for the four closed-end funds. Prior to applying the joint, the study first implemented the individual variance ratio tests advanced by Lo and MacKinlay (1988), and Wright (2000). The test results from both the individual variance ratio tests of Lo and MacKinlay (1988), and Wright (2000) variance ratio tests reject the null hypothesis that the return series for the four closed-end funds are random walk processes. Similarly, the results from the joint variance ratio tests corroborate those obtained from the individual variance ratio procedures by rejecting the null hypothesis that the return series for the four closed-end funds follow a random order. The study checks the robustness of the results from both the individual and joint variance ratio test by applying the runs test. Interestingly, the runs test provided consistent results with the other procedures by rejecting the null hypothesis that the return series for the four closed-end funds follow a random order.

In all, the results from the various joint variance ratio tests reveal that the returns for the four closed-end funds including CHN, GCH, JFC, and TFC do not exhibit random walk behavior. These results suggest that shocks to the returns for these funds are temporary, indicating that movements in returns for the funds cannot be predicted using past information. Above all, the rejection of random walk hypothesis suggests that the weak-form market efficiency hypothesis does not hold for China's closed-end funds market for the period under consideration. This finding implies that the China's closed-end funds market presents both individual and institutional investors with opportunities to garner abnormal returns.

References

1. Ayadi O.F., Pyun C.S. An application of variance ratio test to the Korean securities market, *Journal of Banking & Finance*, 1994; 18; 643-658.
2. Belaire-Franch G., Contreras D. Ranks and signs-based multiple variance ratio tests, Working paper, University of Valencia, 2004.
3. http://les1.man.ac.uk/sapcourses/esgc/Papers2004/Belaire-Franch.pdf
4. Belaire-Franch G., Opong K.K. A Variance ratio test of the behaviour of some FTSE equity indices using ranks and signs, *Review of Quantitative Finance and Accounting*, 2005a; 24; 93-107.
5. Belaire-Franch G., Opong, K.K. Some evidence of random walk behavior of Euro exchange rates using ranks and signs, *Journal of Banking and Finance*, 2005b; 29; 1631-1643.
6. Berkowitz J., Killian L. Recent developments in bootstrapping time series, *Econometric Reviews*, 2000; 19; 1-48.
7. Berneburg M. Are European equity style indexes mean reverting? Testing the validity of the efficient market hypothesis, Discussion Paper no. 193, Institut Fur Wirtschaftsforschung Halle; Halle; Germany; 2004. Black F. Noise, Journal of Finance 1986; 41; 529-543.
8. Chang K-P., Ting K.S, A variance ratio test of the random walk hypotheses for Taiwan's stock market, *Applied Financial Economics*, 2000; 10; 525-532.
9. Chow K.V, and Denning KC, A simple multiple variance ratio test, *Journal of Econometrics*, 1993; 58; 385-401.
10. Coggin T.D., Long memory in equity style indexes, *The Journal of Portfolio Management*, 1998; Winter; 37-46.
11. Dedondt W. Thaler R. Does the stock market overreact? *Journal of Finance*, 1985; 40; 793-808.
12. Efron B. Bootstrap methods: another look at the jackknife, *Annals of Statistics*, 1979; 7; 1-26.
13. Fama E. The behaviour of stock market prices, *Journal of Business*, 1965; 38; 34-105.
14. Fama E. Efficient capital markets: a review of theory and empirical work, *Journal of Finance*, 1970; 25; 383-417.
15. Fama E., French K. Permanent and temporary components of stock prices, *Journal of Political Economy*, 1988; 47; 246-273.
16. Fong W.M., Koh S.K., Ouliaris S. Joint variance-ratio tests of the martingale hypothesis for exchange rates, *Journal of Business and Economic Statistics*, 1997; 15; 51-59.
17. Hoque H., Kim J.H., Pyun C.S. A comparison of variance ratio tests of random walk: a case of Asian emerging stock markets, *International Review of Economics and Finance*, 2007; forthcoming.
18. Huang B-N. Do Asian stock market prices follow random walks? Evidence from variance ratio test, *Applied Financial Economics*, 1995; 5; 251-256.
19. Kawakatsu H., Morey M.O. An empirical examination of financial liberalization and the efficiency of emerging market stock prices, *Journal of Financial Research*, 1999; XXII; 385-411.
20. Kendall M. The analysis of economic time series, *Journal of the Royal Statistical Society Series*, A 1953; 96; 11-25.

21. Kim J.H. Wild bootstrapping variance ratio tests, *Economics Letters*, 2006; 92; 38-43.
22. Lee C., Chen G., Rui O. Stock returns and volatility on China's stock markets, *Journal of Financial Research,* 2001; 24; 523-543.
23. Lehmann B.M. Fads, Martingales and market efficiency, *Quarterly Journal of Economics*, 1990; 105, 1-28.
24. Li, H., Maddala G.S. Bootstrapping time series models, *Econometric Reviews*, 1996; 15; 115-158.
25. Lima E.J.A., Tabak B.B. Tests of the random walk hypothesis for equity markets: evidence from China, Hong Kong and Singapore, *Applied Economics Letters*, 2004; 11; 255-258.
26. Lo A.W. Long-term memory in stock market prices, *Econometrica*, 1991; 59; 1279-1313.
27. Lo A.W., MacKinlay A.C. Stock market prices do not follow random walks: evidence from a simple specification test, *The Review of Financial Studies*, 1988; 1; 41-66.
28. Lo A.W., MacKinlay A.C. The size and power of the variance ratio test in finite samples, *Journal of Econometrics*, 1989; 40; 203-238.
29. Mammen E. Bootstrap and wild bootstrap for high dimensional linear models, *The Annals of Statistics*, 1993; 21; 255-285.
30. Mun F.W., Kee K.S. Do Asian stock market prices follow martingales? Evidence from spectral shape tests, *Asia Pacific Journal of Management*, 1994; 11; 345-359.
31. Nuveen Investments (http://www.etfconnect.com)
32. OECD. White paper on corporate governance in Asia, OECD Publications 2003; Paris.
33. Peng K-L, WU C-H., Goo Y-J. The development of a new statistical technique for relating financial information to stock market returns, International Journal of Management 2004; 21; 492-505.
34. Poterba J.M., Summers L.H. Mean reversion in stock returns: evidence and implications, *Journal of Financial Economics*, 1988; 22; 27-59.
35. Richardson M. Temporary components of stock prices: a skeptic's view, *Journal of Business & Economic Statistics*, 1993; 11; 199-207.
36. Richardson M., Smith T. Tests of financial models in the presence of overlapping observations, *The Review Financial Studies*, 1991; 4; 227-254.
37. Ryoo H.J., Smith G. Korean stock prices under price limits: variance ratio tests of random walks. *Applied Financial Economics*, 2002; 12; 475-484.
38. Stangle B. Market efficiency versus behavioral finance, *Journal of Applied Corporate Finance*, 2005; 17; 124-134.
39. Savin N.E. Multiple Hypothesis Testing. In: Griliches Z. Intriligator MD (Eds), Handbook of Econometrics, vol. 2. Oxford: North-Hollan; 1984, Chapter 14.
40. Stoline M.R., Ury H.R., Tables of the Studentized maximum modulus distribution and an application to multiple comparisons among means, *Technometrics*, 1979; 21; 87-93.
41. Whang Y-J., Kim J. A multiple variance ratio test using subsampling, *Economics Letters*, 2003; 79; 225-230.
42. White H. Asymptotic theory for econometricians. Academic Press, New York; 1999.
43. Wright J.H. Alternative variance-ratio tests using ranks and signs, *Journal of Business & Economic Statistics*, 2000; 18: 1-9.

Appendix A

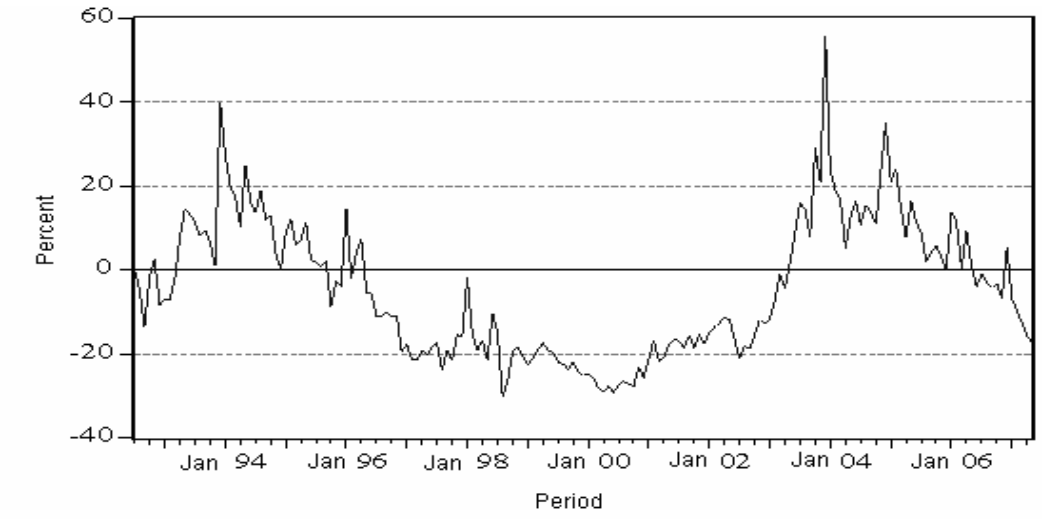

Fig. 1. Return for China Fund

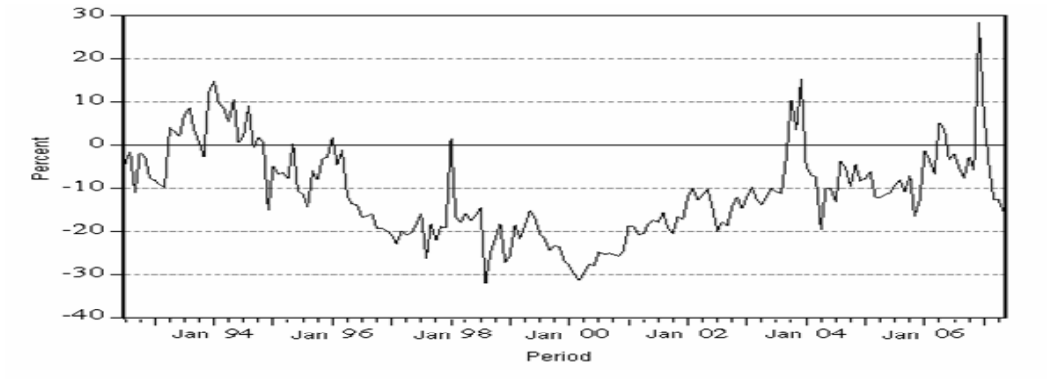

Fig. 2. Return for Greater China Fund

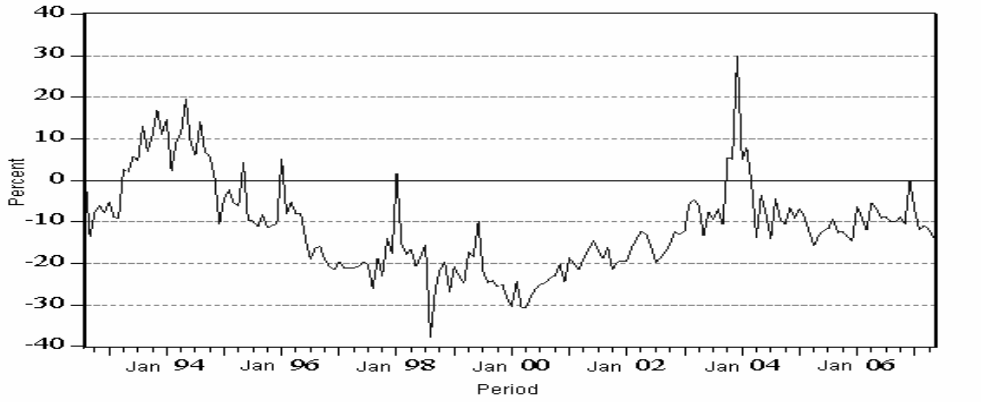

Fig. 3. Return for Jardine Fleming China Region Fund

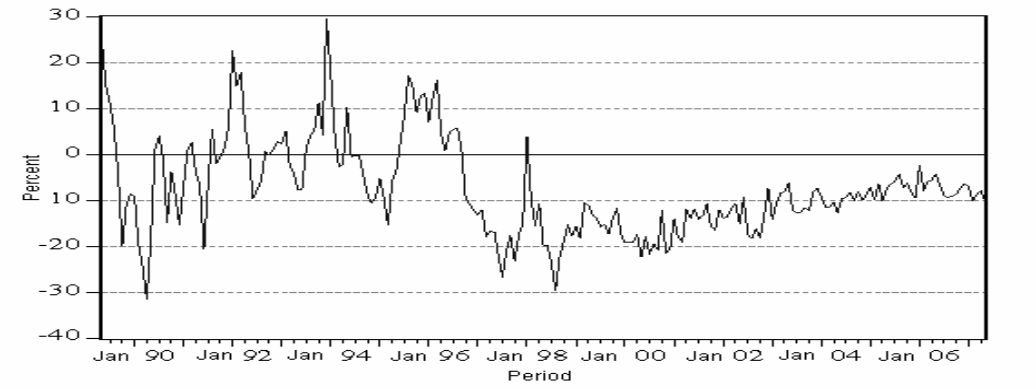

Fig. 4. Return for Taiwan Greater China Fund

Table 1. Summary statistics for closed-end fund returns (percent)

Statistic	CHN	GCH	JFC	TFC
Mean	-4.44	-11.00	-11.20	-7.60
Median	-6.74	-12.00	-12.10	-9.30
Maximum	55.67	28.50	29.80	29.50
Minimum	-30.37	-32.20	-37.70	-31.60
Std. Dev.	16.28	10.50	11.00	10.30
Skewness	0.57	0.56	0.75	0.81
Kurtosis	2.93**	3.360**	3.71**	3.78***
Jarque-Bera	9.75***	10.187***	20.25***	28.93***
Observations	179	179	178	217

Notes: *** and ** indicate rejection at of the null hypothesis at the 1 and 5 percent levels, respectively. CHN = China fund, GCH = Greater China Fund, JFC = Jardine Fleming China Region Fund, and TFC = Taiwan Greater China Fund.

Table 2. Variance ratio test results for closed-end fund returns

K	M1	M2	R1	R2	S1
CHN					
2	11.85***	8.82***	12.29***	11.86***	10.54***
4	18.42***	14.00***	19.29***	18.48***	16.18***
6	22.76***	17.67***	23.92***	22.80***	19.60***
8	26.09***	20.68***	27.56***	26.14***	22.35***
GCH					
2	10.81***	7.85***	11.39***	11.12***	10.84***
4	16.46***	12.35***	17.60***	17.06***	16.10***
6	19.70***	15.21***	21.29***	20.58***	19.40***
8	21.98***	17.32***	24.03***	23.10***	22.00***
JFC					
2	11.07***	7.25***	11.39***	11.24***	11.54***
4	17.35***	11.43***	17.93***	17.69***	17.75***
6	21.10***	14.16***	21.97***	21.68***	21.33***
8	23.84***	16.30***	24.98***	24.60***	23.86*
TFC					
2	11.60***	7.45***	11.85***	11.67***	11.74***
4	16.21***	10.92***	17.24***	16.60***	17.24***
6	18.44***	13.05***	20.23***	19.15***	24.22***
8	20.17***	14.88***	22.67***	20.15***	22.35***

Notes: ***, ** and * indicate level of significance at the 1, 5 and 10 percent, respectively. K = number of lags. CHN = China fund, GCH = Greater China Fund, JFC = Jardine Fleming China Region Fund, and TFC = Taiwan Greater China Fund.

Table 3. Joint variance ratio test results for closed-end fund returns

Series	CD1	CD2	JR1	JR2	JS1	Wald	WB(5% CV)
CHN	26.09***	20.68***	27.56***	26.14***	22.35***	784.93***	-3.19***
GCH	21.98***	17.32***	24.03***	23.10***	22.00***	525.64***	-2.81***
JFC	23.84***	16.30***	24.98***	24.60***	23.86***	633.48***	-2.29***
TFC	20.17***	14.88***	22.67***	21.15***	22.35***	431.16***	-2.06***

Notes: ***, ** and * indicate level of significance at the 1, 5 and 10 percent, respectively. K = number of lags. CHN = China fund, GCH = Greater China Fund, JFC = Jardine Fleming China Region Fund, and TFC = Taiwan Greater China Fund.

Table 4. Runs test results for closed-end fund returns

	CHN	GCH	JFC	TFC
Observations (N)	179	179	178	217
Run above K (+)	86	82	81	88
Percent (%)	48%	46%	46%	41%
Runs below K (-)	93	97	97	129
Percent (%)	52%	54%	54%	59%
Expected runs (m)	90	90	89	106
Actual runs (R)	14	26	28	38
K	-4.04	-1.10	-1.12	-7.60
P-value	0.00	0.00	0.00	0.00

Notes: ***, ** and * indicate level of significance at the 1, 5 and 10 percent, respectively. K = mean, CHN = China fund, GCH = Greater China Fund, JFC = Jardine Fleming China Region Fund, and TFC = Taiwan Greater China Fund. Positive K implies that the number of actual runs is larger than the number of expected runs; negative K implies that the number of actual runs is less than the number of expected runs. Rejection means: rejections of the null hypothesis that the number of actual runs is equal to the number of expected runs at the 5% or 1% significance level.