Performance Persistence in Hedge Funds: Australian Evidence

Abstract

This paper tests the performance persistence of Australian hedge funds for the period July 2000 to June 2005. Our database is unique in that it is free of survivorship bias and is the most comprehensive database of Australian hedge funds. We employ both parametric and non-parametric approaches to identify persistence. We find strong evidence of short-term persistence and weak evidence of long-term winning persistence. Tests of multi-period performance also reveal weak evidence of losing persistence. We also report weak evidence of persistence in both stock picking and market timing. We document that stock-picking persistence is driven mainly by gains while market-timing persistence is driven by losses.

JEL Classification: G12, G20 and G23

Keywords: Persistence, Hedge Funds, Stock Selection, Market Timing

I. Introduction

A number of studies of mutual funds, report evidence of short-term persistence (see, for example, Brown and Goetzmann (1995), Goetzmann and Ibbotson (1994), Hendricks, Patel and Zeckhauser (1993) and Elton, Gruber and Blake (1996)). Carhart (1997) suggests that such short-term persistence is attributable to price momentum. However, literature on performance persistence of hedge funds has only emerged in recent years.

Agarwal and Naik (2000) suggest that performance persistence is more important for hedge funds than mutual funds because performance persistence has bigger impact on the survival of hedge funds. Most hedge funds studies have focused on the US market where the industry is mature. Even so, the results are mixed and inconclusive. Brown, Goetzmann and Ibbotson (1999) were among the first to investigate persistence of US hedge funds. Using a dataset of 399 offshore funds for the period 1989 to 1995, they find evidence of positive risk-adjusted returns. There is little evidence of performance persistence in raw returns, however, and almost no evidence in style-adjusted returns.

Investigating a sample of 324 US hedge funds, Kat and Menexe (2003) report little evidence of mean return persistence. Peskin, Urias, Anjilvel and Boudreau (2000) and Schneeweis, Kazemi and Martin (2001) document similar findings. Applying an arbitrage pricing theory framework to examine risk-adjusted performance, Bares, Gibson and Gyger (2003) report weak evidence of persistence. However, Kouwenberg (2003) tests US hedge fund performance for the 1995-1997 period, taking into account non-surviving funds, and documents support for performance persistence. Harri and Brorsen (2004) similarly report strong evidence of performance persistence among US hedge funds; they document a strong negative relationship between hedge fund capitalization and returns. Agarwal and Naik (2000) test persistence by varying measurement periods from quarterly to half-yearly and yearly intervals. They also use a multi-period framework rather than the traditional two-period framework. Finding maximum persistence at quarterly intervals, they conclude that

(as with mutual funds) hedge fund performance persists only in the short term. Looking at Asian hedge funds, Koh, Koh and Teo (2003) similarly document strong evidence of persistence at monthly to quarterly horizons.

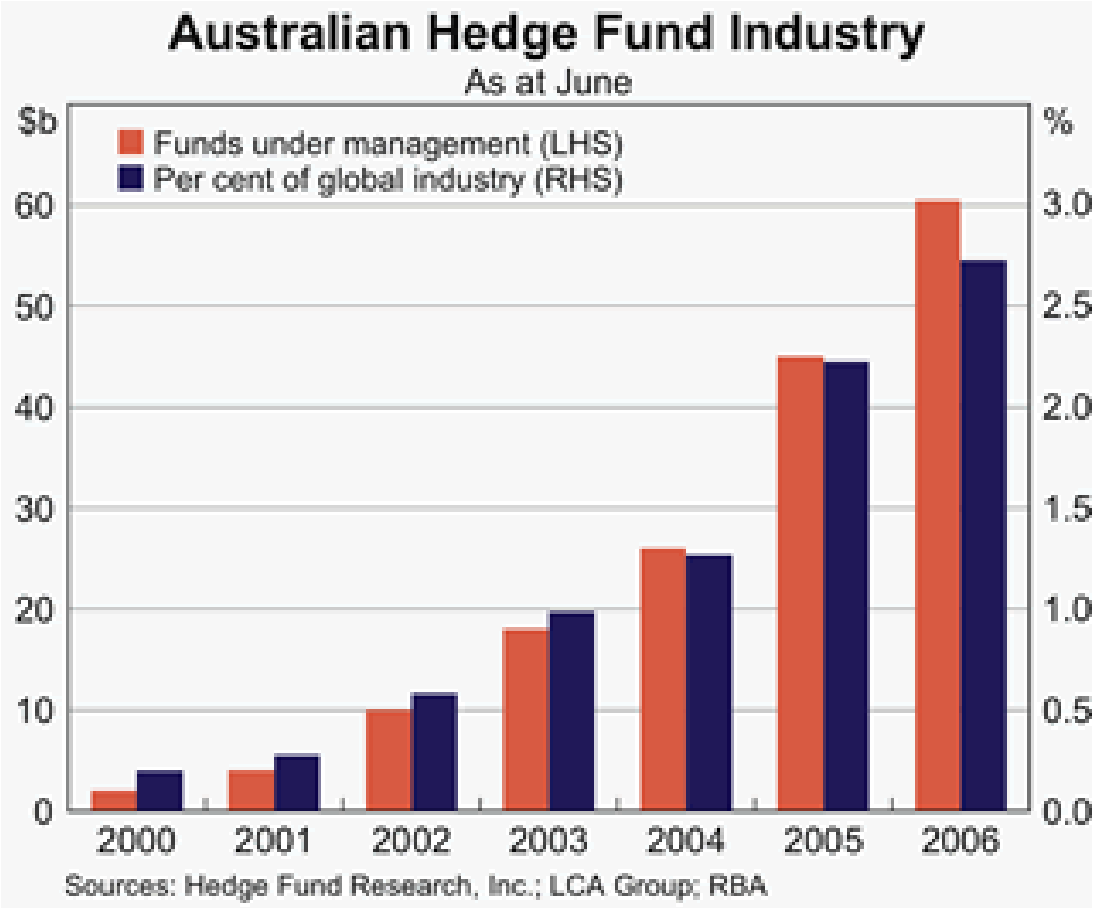
Baquero, Horst and Verbeek (2005) recently noted that look-ahead bias among hedge funds is increasing due to the high level of total risk that characterizes these funds. Controlling for such bias, they examine the performance persistence of 1797 US hedge funds and report evidence of persistence in quarterly returns that is consistent with Agarwal and Naik (2000) and others. Nonetheless, there is also evidence that hedge fund performance can persist in the long term. Based on monthly returns for a sample of 1665 US hedge funds, Edwards and Caglayan (2001) report that more 25% of the funds generate positive excess returns. Most notably, they report significant performance persistence over one- and two-year horizons.

In this paper, we use the most comprehensive database on Australian hedge funds and are the first to investigate persistence for Australian hedge fund returns. Our motivations for studying Australia are as follows. First, since the early 1990s the Australian hedge fund industry has grown dramatically both in terms of the number of funds as well as fund under management. Consequently, it plays an increasingly influential role in the nation's financial markets and general economy. Figure 1 shows the total assets under management for the Australian hedge fund industry for the period 2001 to 2006.

Figure 1 also shows that as of 2002, the industry only managed AU$10 billion in assets but this figure has increased six fold over the last four years reaching AU$60 billion in June 2006. That means an average growth rate of funds under management over the last four year for Australian hedge funds is around 150% per year. Along with funds under management, the percentage of global hedge fund industry has also increased dramatically. Since 2002, the Australian hedge fund industry has grown from 0.5% to over 2.5% of global hedge fund industry.

Figure 1

Total Fund Under Management of Australian Hedge Funds



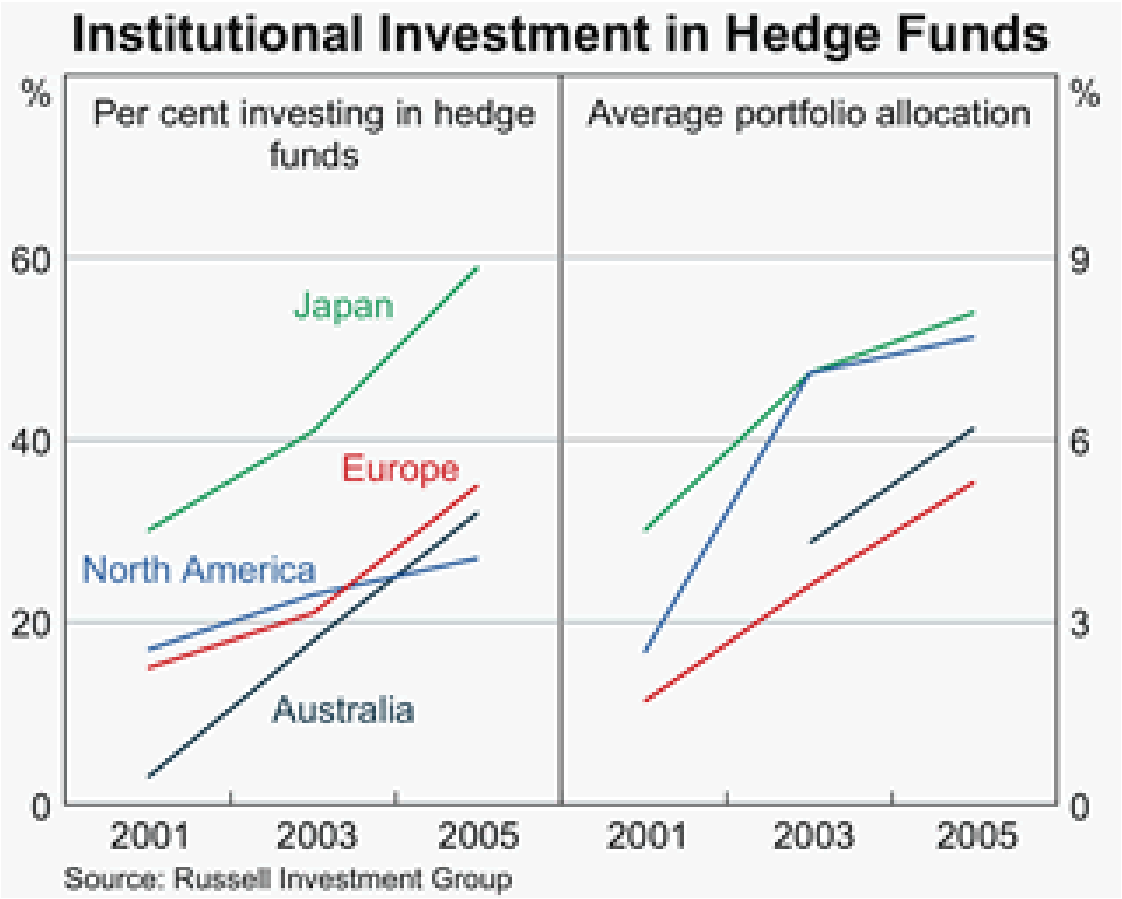
Source: Reserve Bank Bulletin – November 2006.

Second, there is a growing trend in the Australian market where conventional mutual funds and superannuation funds are increasing the proportion of hedge funds in their portfolios. Hedge funds are well known for their relaxed regulation and high risk with high level of leverage. Hedge funds are designed mainly for sophisticated investors and institutional investors. The current report on Australian hedge funds by RBA reveals that 65% of funds are from wealthy individual and 35% are from institutional investors (RBA Bulletin, 2006). As

mutual funds and superannuation funds start adding hedge funds to their portfolio, indirectly, conventional investors are investing in hedge funds with little protection.[1]

Figure 2

Institutional Investors in Australian Hedge Fund Industry



Source: Reserve Bank Bulletin – November 2006.

Figure 2 shows the institutional investors investing in Australian hedge funds. In 2001, less than 5% of Australian institutional investors invested in hedge funds with less than 3% of their portfolio. By 2005, almost one third of Australian institutional investors included hedge funds in their portfolio with average proportion of over 6%. Australian superannuation funds have invested over A$4 billion in hedge funds by the end of 2005. Australian pension funds

[1] APRA and RBA have issued several warnings for mutual funds and superannuation funds about including hedge funds in their portfolios. However, specific legislation on this issue is yet to be introduced.

have also allocated over A$6.9 billion in both domestic and international hedge funds (Axiss Australia, 2007). Given the above discussion it is important that we test performance persistence for Australian hedge funds. Our objective is also to contribute to the limited literature on hedge funds persistence using non US data. The rest of the paper is organized as follows. Section II discusses the legal environment while section III presents the data and the methodology employed in this paper. Section IV presents the findings and section V concludes.

II. The Legal Environment

Hedge funds in both the US and Australia are subject to less restrictive regulations than mutual funds. In fact, this greater freedom is at the essence of their operations. A hedge fund can be defined as "an unregulated, highly levered investment fund that invests in stocks, bonds, currencies and other financial instruments for wealthy individuals" (Gardner, Mills and Cooperman (2000), p. 321).

The US Securities Act of 1993 limits a hedge fund to comprise no more than 35 "non-accredited" investors.[2] The Investment Company Act of 1940 caps the total number of investors at 499 without registration. Other than those in the restricted "non-accredited" and "accredited" classes, investors are required to have more than $5 million in assets (Fung and Hsieh 1999, p. 316). These wealthier investors are considered sophisticated and knowledgeable enough to protect their interests.

Under current SEC regulations, an investment advisor (effectively, a hedge fund) can advise up to 14 clients without registration (Wider and Scanlan, 2004, p. 91). The SEC allows a legal organization to be counted as one client, however, because a hedge fund manager provides investment advice based on the fund's investment objectives and not on the objectives of the legal organization's individual owners. Consequently, a legal organization

[2] An "accredited investor" is defined as "an individual who has more than $1 million in financial wealth or has had an income of more than $200,000 in the previous two years."

may have many investors and still be counted as a single client of a hedge fund. With this structure, an ordinary investor could invest in a hedge fund through an agent and be exposed to a higher level of risk.

In Australia, the Corporations Act 2001 requires hedge funds to register with the Australian Security and Investment Commission (ASIC), unless the fund has fewer than 20 investors and will not be professionally promoted or the fund will be offered only to "sophisticated investors." A sophisticated investor is defined as anyone who has at least A$2.5 million in assets or who has income of more than A$250,000 in the previous two years; an offering is also deemed limited to sophisticated investors if the required minimum investment is A$500,000 or more (Corporation Act 2001, Vol.3, SECT 610 ED and SECT 708). Exemption from registration frees a fund from all ASIC regulations and requirements.

III. Data and Methodology

A. Data

We obtained the data for this study from the LCA Group. To our knowledge, it is by far the most comprehensive dataset regarding Australian hedge funds. It includes 163 hedge funds for the period January 1998 to June 2005. The first group includes 77 funds with 36 months of returns from July 2002 to June 2005. The second group includes 45 funds with 48 months of returns from July 2001 to June 2005. Finally, the third group includes 28 funds with 60 months of returns from July 2000 to June 2005. We use the All Ordinaries Index as a proxy for Australian market returns and the three-month deposit rate as a proxy for the risk-free rate. We obtained the data for these two variables from Datastream. Two control variables, (SMB) and (HML) are constructed using Australian equity indexes from Datastream. This study uses returns of ASX Small Ordinaries minus ASX100 to proxy SMB. In terms of HML, this paper utilizes the Salomon Smith Barney Australian (SSBA) equity style indexes. Specifically, HML is calculated by subtracting returns of the SSBA growth stock index from returns of the SSBA value stock index.

B. Methodology

Hedge funds with alternative investment strategies carry different risks and thus performance varies across them. Consequently, it makes little sense to compare the persistence of hedge funds adopting different strategies. This chapter therefore compares funds in the same investment strategies. Following Brown and Goetzmann (1995), hedge fund performance in the current period is compared to its performance in a previous period.

One of the most important steps in measuring persistence is to identify which measure to apply. This chapter first uses excess return (XR) to measure performance. XR is calculated by subtracting average hedge fund returns from individual hedge fund return. This measure, however, does not account for the varying risk levels that hedge funds carry. Therefore, this chapter applies a second measure: average excess return (AXR) to account for the hedge funds' risks. The difference between a hedge fund's return and average fund returns is divided by the residual standard deviation from the regression of the fund's return against the average return of all hedge funds in the same category to obtain AXR. Similar to Agarwal and Naik (2000a), both parametric and non-parametric approaches are employed to test persistence. In the parametric framework, current XR and AXR are regressed against lagged XR and AXR.

$$XR_{it} = \alpha_n D_n + \alpha_p D_p + \beta_{i,n} D_n XR_{i,t-1} + \beta_{i,p} D_p XR_{i,t-1} + \varepsilon_{it} \quad (1)$$

where $D_n = 1$ if $XR_{i,t-1} < 0$

$D_p = 1$ if $XR_{i,t-1} > 0$

$$AXR_{it} = \alpha_n D_n + \alpha_p D_p + \beta_{i,n} D_n AXR_{i,t-1} + \beta_{i,p} D_p AXR_{i,t-1} + \varepsilon_{it} \quad (2)$$

where $D_n = 1$ if $AXR_{i,t-1} < 0$

$D_p = 1$ if $AXR_{i,t-1} > 0$

We then apply a non-parametric test of performance that is popular in the hedge fund literature. This test requires the identification of winners and losers. Following Brown and

Goetzmann (1995), a winner (loser) is defined as a fund whose XR is greater (smaller) than the median XR of all funds in its category. Persistence is taken to mean that a fund remains a winner or loser in two or more consecutive periods. A fund that remains a winner (loser) for two consecutive periods is denoted as WW (LL). A fund that is a winner (loser) in the first period and a loser (winner) in the second is denoted as WL (LW).

Under this non-parametric approach, we use three measures to identify persistence:

First, we calculate the cross product ratio (CPR) which can be shown as:

$$CPR = (WW \times LL)/(WL \times LW) \tag{3}$$

The CPR measure shows the number of funds with performance persistence divided by the number of funds with no persistence. The null hypothesis states that if there is no performance persistence, and CPR will equal one. The statistically significant cutoff for CPR is defined using the standard error of the natural logarithm of CPR (Agarwal and Naik, 2000).

$$\sigma_{\ln(CPR)} = \sqrt{1/WW + 1/WL + 1/LW + 1/LL} \tag{4}$$

Second, we employ the Chi-square statistic (CHI), which compares the observed frequency distribution with the expected frequency distribution. CHI is calculated as:

$$CHI = (WW - D1)^2/D1 + (WL - D2)^2/D2 + (LW - D3)^2/D3 + (LL - D4)^2/D4 \tag{5}$$

where D1 = (WW+WL)*(WW+LW)/N

D2 = (WW+WL)*(WL+LL)/N

D3 = (LW+LL)*(WW+LW)/N

D4 = (LW+LL)*(WL+LL)/N

This statistic is tested at the 5% level of significance, which has a critical value of 3.84.

Third, we estimate the percentage of repeating winners (PRW) which is calculated as:

$$PRW = WW/(WW+WL) \quad (6)$$

Given no significant performance persistence, the expected value for each of the four groups WW, LL, WL, LW is 25%. Hence, the expected value of PRW under the null hypothesis of no persistence is 0.5 or 50%. A binomial test applied to PRW can determine whether the proportion of repeated winners significantly exceeds the expected value of 50%.

In addition, we use alpha from the Fama-French three-factor model to identify winners and losers. For each investment strategy, an aggregate metric is constructed using average returns of all funds within that strategy. Individual fund returns are then regressed against the aggregate fund metric, controlling for firm size and book-to-market of equity. Funds with positive alphas are designated winners and those with negative alphas are designated losers.

We also test for persistence in stock selection and market timing in the context of a simple market-timing model, controlling for size and book-to-market, based on Treynor and Mazuy (1966). The model is expressed as:

$$R_{p,t} = \alpha_p + \beta_{p1}R_{mt} + \beta_{p2}SMB + \beta_{p3}HML + \gamma_p R^2_{mt} + \varepsilon_{p,t} \quad (7)$$

An alpha (gamma) that is positive and significant is taken to reflect that fund managers are successful in picking undervalued stocks (timing the market). The regressions are run for each fund in two equal sample periods to test whether Australian hedge fund managers can pick undervalued stocks and time the market consistently.

Finally, this study conducts a multi-period test for performance persistence. Following, Agarwal and Naik (2000), we count the number of consecutive winners and losers for different periods. Then we compare the observed number of consecutive winners and losers to the expected value and test the statistical significance using the Kolmogorov-Smirnov (K-

S) test. If the actual sequences are significantly higher than their expected counterparts this will be taken as evidence of persistence.

IV. Empirical results

Table 1 presents descriptive statistics of 77 Australian hedge funds from July 2002 to June 2005. The funds are divided into three groups based on their investment strategies. Two strategies dominate among Australian hedge funds. A Long, Short and Absolute fund (LSA) selects long and short positions to maximize risk-adjusted returns; it uses proprietary techniques to select long and short positions. A Fund of Funds (FF) allocates capital among other investment funds that hold diversified mixes of investment vehicles; this ensures greater diversification for investors and allows them access to products offered by other hedge funds.

There are 31 LSAs, 27 FFs and 19 other funds – the latter follow either market-neutral, global-macro, event-driven or fixed-income strategies. Among the three groups, based on raw unadjusted data, LSAs seem to perform the best. The average mean monthly return among these funds during this period is 1.33%. LSAs, however, also carry the highest level of risk, with a sample average standard deviation of 2.17% per month. The next best performing group is “other strategy” funds, with an average monthly return of 0.98% and a standard deviation of 0.88% per month. FFs generate the lowest average monthly return of 0.63%, with a standard deviation of 0.68% per month.

Table 1
Descriptive Statistics

	Long, Short and Absolute	Fund of Funds	Other Strategies
Number of funds	31	27	19
Mean	0.0133	0.0063	0.0098
Standard Error	0.0036	0.0011	0.0015
Median	0.0166	0.0067	0.0094
Standard Deviation	0.0217	0.0068	0.0088
Sample Variance	0.0005	0.0000	0.0001
Excess Kurtosis	-0.2470	-0.4273	-0.5294
Skewness	-0.4484	-0.2412	0.0236
Range	0.0852	0.0278	0.0335
Minimum	-0.0369	-0.0091	-0.0070
Maximum	0.0484	0.0187	0.0265
Confidence Level (95%)	0.0073	0.0023	0.0030

Table 2 presents the results of auto-regressions of excess returns (XR) and average excess returns (AXR) for 77 funds for the period July 2002 to June 2005. The dummy variables Dn and Dp are used to separate losing and winning cases. The two coefficients $\beta_{i,n}$ and $\beta_{i,p}$ measure the level of return auto-correlation of hedge funds among the losing and winning cases. For example, a positive and significant $\beta_{i,n}$ would indicate some level of auto-correlation or persistence among the losing cases while a positive and significant $\beta_{i,p}$ would indicate some level of persistence among the wining cases.

Table 2
Performance Persistence of Australian Hedge Funds (Parametric Approach)

Panel A presents the findings for the following model:

$$XRit = \alpha i,nDn + \alpha i,pDp + \beta i,nDnXRi,t\text{-}1 + \beta i,pDpXRi,t\text{-}1 + \varepsilon it \quad (1)$$

where Dn = 1 if XRi,t-1 < 0
Dp = 1 if XRi,t-1 > 0

XR measures the excess return of a hedge fund in relation to average hedge fund returns within the same category. Panel B presents the findings for the following model:

$$AXRit = \alpha i,nDn + \alpha i,pDp + \beta i,nDnAXRi,t\text{-}1 + \beta i,pDpAXRi,t\text{-}1 + \varepsilon it \quad (2)$$

where Dn = 1 if AXRi,t-1 < 0
Dp = 1 if AXRi,t-1 > 0

AXR measures average excess return, the excess return of a hedge fund in relation to average hedge fund returns in the same category, divided by the residual standard deviation from a regression of the hedge fund return on average returns of all hedge funds in the same category. (**) shows number of funds significant at the 5% level.

Panel A: Auto regressions in excess returns (XR)					
	$\alpha_{i,n}$	$\alpha_{i,n}$	$\beta_{i,n}$	$\beta_{i,p}$	Adj R^2
Mean	-0.0021	0.0002	-0.0201	0.0780	0.0812
Standard Deviation	0.0093	0.0091	0.3623	0.4242	0.0628
Max	0.0289	0.0247	0.7504	1.2737	0.2803
Min	-0.0358	-0.0211	-1.0908	-1.0015	0.0008
Positive case	33	34	36	43	
(**)	0	5	4	10	
Negative case	44	43	41	34	
(**)	4	7	5	4	
Panel B: Auto regressions in average excess returns (AXR)					
	$\alpha_{i,n}$	$\alpha_{i,n}$	$\beta_{i,n}$	$\beta_{i,p}$	Adj R^2
Mean	2.5609	1.9652	0.1623	0.1041	0.0646
Standard Deviation	14.0750	8.2437	2.6775	0.5821	0.1148
Max	113.8946	66.4760	16.5045	4.4108	0.8905
Min	-9.8973	-8.3668	-12.6573	-0.8439	0.0014
Positive case	56	58	34	35	
(**)	32	24	12	3	
Negative case	11	9	33	32	
(**)	2	0	10	6	

Panel A shows that 36 of 77 funds have a positive βi,n coefficient, but only four are statistically significant at the 5% level. Panel A also shows that 43 of 77 funds have a positive βi,p coefficient and 10 are statistically significant at the 5% level. This suggests that only four funds show significant short-term losing persistence, while 10 show significant short-term winning persistence. In brief, applying raw excess return as the performance measurement produces some evidence of short-term persistence, especially of positive performance.

Panel B shows the results of measuring hedge fund performance (XR) against average excess returns (AXR). Our findings show that 34 funds have a positive $\beta_{i,n}$ coefficient and 12 are significant at the 5% level. We also report that 35 of 77 funds have a positive $\beta_{i,p}$ coefficient, but only three are significant at the 5% level.[3] In this panel, losers dominate in persistence: 12 (3) funds show significant short-term losing winning persistence. It is worth noting that 10 funds show significant ability to switch from being losers to winners, while six do not have the ability to avoid changing from being winners to losers.

Overall, the findings show some evidence of performance persistence among Australian hedge funds. Controlling for risk considerably reduces (increases) the number of cases of observed winning (losing) persistence; in fact, most persistence is then on the negative side, which is consistent with prior literature on hedge funds and mutual funds. Accordingly, judging hedge fund persistence by examining only raw returns could be greatly misleading. Table 3 presents the results under the non-parametric approach for the group of 77 funds (for the period July 2002 to June 2005), sorted for three groups based on strategy pursued—LSA, FF and other. The table also shows aggregated results for all funds.

[3] There are 10 funds with fewer than two months of negative AXR. Hence, model 2 could not be run on those funds. Instead, a simple auto-regression model is run on those funds without dummy variables. One fund shows evidence of performance persistence at the 10% level and one at the 1% level.

Table 3
Performance Persistence of Australian Hedge Funds (Non-Parametric Approach)

This table presents the results of non-parametric performance persistence for a sample of 77 hedge funds from July 2002 to June 2005. A winner (loser) is defined as a fund whose excess return is greater (less) than the median excess return of all funds in its category. Persistence is taken to mean that a fund remains a winner or loser in two consecutive periods. Funds that remain a winner or loser for two consecutive periods are denoted as WW or LL. Otherwise they are denoted as WL (winner-loser) or LW (loser-winner). (**) denotes the number of months out of 35 months in the sample that shows significant performance persistence at the 5% level using CPR and CHI.(*) denotes the number of months out of 35 months in the sample that have PRW greater than 50%. (#) denotes statistical significance for the overall CPR and CHI statistics at the 5% level. Z stat is the statistical measure of CPR. It is calculated by dividing the natural log of CPR by the standard error of natural logarithm of CPR. At the 5% level, the critical value for Z stat is 1.96 and the critical value for CHI is 3.84.

Panel A	Total hedge funds							
	WW	WL	LW	LL	CPR	CHI	PRW(%)	Z stat
Mean	19.229	17.629	17.600	22.543	1.903	2.981	0.125	0.714
Standard Deviation	3.482	3.549	3.432	3.492	1.682	4.075	0.023	1.557
Max	27	23	23	30	8	17.721	0.175	4.023
Min	14	10	10	17	0	0.010	0.091	-1.714
(**)					11**	11**	16*	
Total	673	617	616	789	1.397#	18.689#	0.125	4.318
Panel B	Fund of Funds							
	WW	WL	LW	LL	CPR	CHI	PRW	Z stat
Mean	6.800	6.086	6.086	8.029	2.843	1.983	0.126	0.477
Standard Deviation	1.746	1.788	1.704	1.740	3.508	2.599	0.032	1.286
Max	10	9	9	11	12.222	8.315	0.185	2.703
Min	4	3	3	5	0.247	0.030	0.074	-1.706
(**)					9**	9**	17*	
Total	238	213	213	281	1.474#	8.808#	0.126	2.963
Panel C	Long, Short and Absolute							
	WW	WL	LW	LL	CPR	CHI	PRW	Z stat
Mean	7.886	7.086	7.057	8.971	2.415	2.103	0.127	0.465
Standard Deviation	1.922	1.976	1.893	1.948	2.625	2.308	0.031	1.350
Max	11	11	11	13	11.917	9.314	0.177	2.859
Min	4	3	4	5	0.165	0.027	0.065	-2.265
(**)					5**	10**	20*	
Total	276	248	247	314	1.415#	8.107#	0.127	2.844
Panel D	Other hedge funds							
	WW	WL	LW	LL	CPR	CHI	PRW	Z stat
Mean	4.543	4.457	4.457	5.543	2.328	1.196	0.120	0.246
Standard Deviation	1.172	1.172	1.172	1.172	3.230	1.655	0.031	1.041
Max	7	7	7	8	14.000	6.343	0.184	2.344
Min	2	2	2	3	0.122	0.059	0.053	-1.985
(**)					2**	3**	17*	
Total	159	156	156	194	1.268	2.319	0.120	1.522

Panel A shows the results for all hedge funds. Over the sample period, there are an average of 19 WW, 18 WL, 18 LW and 22 LL. The results generated from applying CPR and CHI are qualitatively similar. Out of 35 months, CPR and CHI both show 11 months with statistically significant performance persistence at the 5% level. PRW is greater than 50% in 16 months. CPR of all the funds is 1.39 with Z statistic of 4.31 (significant at the 1% level), which

indicates that Australian hedge funds show performance persistence in a short-term horizon (monthly). CHI calculated for the sample is 18.68, again highly significant, and hence reinforces the above conclusion.

Panels B, C and D show the results for each group of hedge funds. FFs (Panel B) show statistically significant performance persistence in nine of 35 months based on CPR and CHI. Overall, these funds have a CHI value of 8.80 and CPR of 1.47, both indicating significance. These results suggest that FFs also demonstrate performance persistence over short horizons. LSAs (Panel C) generated similar results: CHI value of 8.10 and CPR of 1.41 with Z statistic of 2.84. The third group, funds pursuing other investment strategies (Panel D), exhibit persistence for two of 35 months when based on CPR and for three of 35 months when based on CHI. In short, our findings indicate that this group does not demonstrate performance persistence.

Table 4 shows the results of regressing individual Australian hedge funds against average returns of the funds within the same category. For each investment strategy, a single aggregate metric is constructed using average returns of all funds within that strategy. Then, controlling for firm size and book-to-market equity, individual fund returns are regressed against the aggregate fund returns. Winners and losers are classified based on the resulting alphas. Funds with positive (negative) alphas are designated winners (losers).

Panel A presents the results for the first group (77 funds) during two consecutive equal periods of 18 months each. The observed alphas are close to zero in both periods. This is expected, as fund returns are regressed against their group's average returns. In the first period, there are 44 winners and 33 losers. In the second period, there are 47 winners and 30 losers. We are also able to identify 28 WW cases, 16 WL cases, 19 LW cases and 14 LL cases. The CHI statistic value is 0.29, the CPR is 1.28, with a Z statistic of 0.53. These numbers indicate that performance persistence does not exist among our sample of Australian hedge funds in the medium (18 months) horizon. Panels B and C show the results

for the second group (45 funds) and third group (28 funds) respectively. As with the first group, the observed CPR and CHI show no sign of persistence. Notably, in all three groups, PRW is greater than 50%. This indicates some winning performance persistence in the medium and long terms.

Table 4
Relative Performance Persistence of Australian Hedge Funds

This table presents performance persistence relative to average returns of funds within the same category. One aggregate metric is constructed using average returns of all funds pursuing a particular strategy. After controlling for SMB and HML, individual fund returns are regressed against the aggregate fund returns. The alphas observed from these regressions identify winners and losers; funds with positive (negative) alphas are designated winners (losers). WW, WL, LW, LL, CPR, CHI, PRW and Z statistic are obtained in a similar fashion as in Table 3. Panel A shows the results for the group of 77 hedge funds having data from July 2002 to June 2005, split into two consecutive sub-periods of equal length (18 months each). Panel B shows the results for the group of 45 hedge funds having data from July 2001 to June 2005, split into two consecutive sub-periods of equal length (24 months each). Panel C shows the results for the group of 28 hedge funds having data from July 2000 to June 2005, split into two consecutive sub-periods of equal length (30 months each).

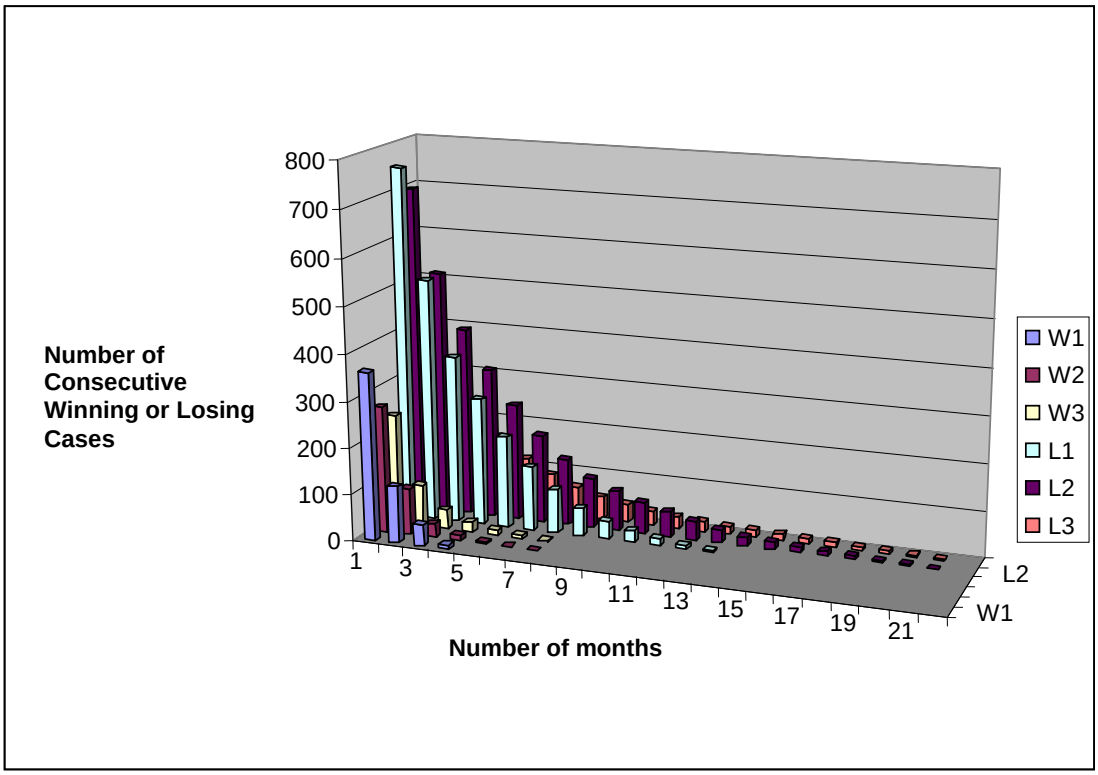
Panel A	Sample of 77 funds from July 2002 to June 2005									
	FIRST PERIOD					SECOND PERIOD				
	Alpha	**Average**	**SMB**	**HML**	**R^2**	**Alpha**	**Average**	**SMB**	**HML**	**R^2**
Mean	0	1	0	0	0.466	0	1	0	0	0.535
Stdev	0.008	0.969	0.451	0.767	0.238	0.007	0.74	0.293	0.808	0.251
Min	-0.039	-0.758	-1.409	-2.707	0.023	-0.022	-0.288	-0.845	-2.366	0.045
Max	0.028	6.057	1.56	2.406	0.957	0.014	3.93	0.747	3.047	0.942
Positive (W)	44					47				
Negative (L)	33					30				
		CPR	**CHI**	**PRW**	**Z stat**					
WW	28	1.289	0.291	0.728	0.54					
WL	16									
LW	19									
LL	14									
Panel B	Sample of 45 funds from July 2001 to June 2005									
	FIRST PERIOD					SECOND PERIOD				
	Alpha	**Average**	**SMB**	**HML**	**R^2**	**Alpha**	**Average**	**SMB**	**HML**	**R^2**
Mean	0.004	0.441	-0.009	-0.142	0.432	0.001	0.502	0.005	-0.077	0.388
Stdev	0.01	0.701	0.413	0.513	0.24	0.006	0.598	0.261	0.656	0.235
Min	-0.011	-0.793	-1.78	-2.301	0.043	-0.016	-0.542	-0.405	-1.67	0.05
Max	0.059	2.803	1.173	1.224	0.849	0.02	3.022	0.696	2.719	0.789
Positive (W)	32					25				
Negative (L)	13					20				
		CPR	**CHI**	**PRW**	**Z stat**					
WW	18	1.102	0.022	0.8	0.147					
WL	14									
LW	7									
LL	6									

Panel C	Sample of 28 funds from July 2000 to June 2005									
	FIRST PERIOD					SECOND PERIOD				
	Alpha	**Average**	**SMB**	**HML**	**R^2**	**Alpha**	**Average**	**SMB**	**HML**	**R^2**
Mean	0.003	0.543	0.019	0.005	0.427	0	0.595	0.016	-0.165	0.383
Stdev	0.008	0.735	0.378	0.449	0.283	0.005	0.598	0.185	0.646	0.216
Min	-0.019	-0.563	-0.564	-1.147	0.029	-0.013	-0.129	-0.327	-1.709	0.031
Max	0.022	2.344	1.018	1.207	0.875	0.012	2.297	0.503	1.868	0.792
Positive (W)	20					18				
Negative (L)	8					10				
		CPR	**CHI**	**PRW**	**Z stat**					
WW	13	1.114	0.016	0.929	0.125					
WL	7									
LW	5									
LL	3									

We also tested performance persistence over multiple periods by counting the number of winners and losers. Figure 3 shows the number of winners and losers for our sample and Table 5 shows the test results.

Figure 3

Number of Repeating Winners and Losers



It is quite clear from Figure 3 that losers significantly outnumber winners. More importantly, the level of persistence on the losing side seems much stronger than on the winning side. For example, no fund in Group 1 is able to win for five consecutive months. On the other hand, two funds in that group lose 13 months in a row. We report similar results for groups 2 and 3.

We compare the actual number of multi-period winners and losers in each group to their expected counterparts under the binomial distribution using the K-S test, as outlined earlier. Determining whether the numbers of winners or losers are significantly higher or lower than expected values gives us evidence of the presence or absence of performance persistence. Table 5 provides the findings of the K-S test for the three fund groups.

Table 5

Multi-period Performance Persistence

This table presents the results of the K-S test for three types of hedge funds based on strategy pursued: long, short and absolute, fund of funds and other.

K-S test persistence of performance				
	Winners		**Losers**	
Group 1: 77 Funds	**K-S stat**	**P-value**	**K-S Stat**	**P-value**
Long Short and Absolute	0.4286	0.2177	0.539	0.0081
Fund of Funds	0.4481	0.0171	0.5455	0.0024
Other strategies	0.4773	0.0976	0.5909	0.0007
Group 2: 45 Funds	**K-S stat**	**P-value**	**K-S Stat**	**P-value**
Long Short and Absolute	0.2727	0.6213	0.3091	0.4669
Fund of Funds	0.3091	0.4669	0.400	0.2521
Other strategies	0.3758	0.2526	0.4167	0.2494
Group 3: 28 Funds	**K-S stat**	**P-value**	**K-S Stat**	**P-value**
Long Short and Absolute	0.3556	0.3936	0.2889	0.6408
Fund of Funds	0.3667	0.3383	0.3758	0.2526
Other strategies	0.3556	0.3936	0.3667	0.3383

Table 5 shows that only fund of funds demonstrate significant multi-period winning and losing persistence at the 5% level, over the shorter assessment window. The remaining investment strategies (LSA and other) do not show evidence of winning performance persistence. In Group 1, (77 funds) all three investment strategies show significant multi-

period losing persistence at the 1% level. Groups 2 and 3, however, show no evidence of winning or losing persistence.

Table 6 presents the results of applying the Treynor and Mazuy (1966) market-timing model to test for persistence of Australian hedge funds in selecting stocks and timing markets, where winners and losers are separated based on the sign of the fund alpha and gamma, respectively. As in the previous tables, the results are presented for three groups based on the length of historical data available. Panel A shows the results for the first group. Based on the signs of estimated alphas, we find that 61 (40) of these funds show possible stock picking skills during the first (second) period. Of these apparent winners, 23 demonstrate significant stock picking skills at the 5% level during the first period, but only four funds demonstrate such skills at a significant level in the second period. Panel A also shows 27 of 77 funds were stock picking winners (WW) and 3 of 77 funds were losers (LL) in both periods.

Table 6
Persistence in Stock Selection and Market Timing

This table presents the results of applying a simple Treynor and Mazuy (1966) market-timing model to test for persistence in selecting stocks and timing markets. The analysis controls for size and book-to-market equity. The model is expressed as:

$$R_{p,t} = \alpha_p + \beta_{p1} R_{mt} + \beta_{p2} SMB + \beta_{p3} HML + \gamma_p R2_{mt} + \varepsilon_{p,t} \quad (7)$$

A stock picking and market timing winner (loser) is one that has a positive (negative) alpha and gamma, respectively. WW (LL) denotes a fund that has positive (negative) alphas or gammas in both sample periods. Numeral in () denotes the number of significant cases at the 5% level. Panel A shows the results for the group of 77 hedge funds with data from July 2002 to June 2005, split into two consecutive sub-periods of equal length (18 months each). Panel B shows the results for the group of 45 hedge funds with data from July 2001 to June 2005, split into two consecutive sub-periods of equal length (24 months each). Panel C shows the results for 28 hedge funds with data from July 2000 to June 2005, split into two consecutive sub-periods of equal length (30 months each).

Panel A	Sample of 77 funds from July 2002 to June 2005											
	FIRST PERIOD						SECOND PERIOD					
	Alpha	Market	SMB	HML	Timing	R2	C	Market	SMB	HML	Timing	R2
Mean	0.006	0.381	0.21	0.284	-0.76	0.419	0	0.348	-0.015	0.066	-1.094	0.427
Stdev	0.013	0.54	0.457	0.811	8.474	0.225	0.009	0.401	0.321	0.57	10.336	0.211
Positive	61 (23)				27 (3)		40 (4)				42 (3)	
Negative	16 (4)				50 (3)		37 (3)				35 (6)	
	Combination over two periods											
WW	27				14		**CPR**	0.183			0.077	
WL	34				13		**CHI**	6.947			22.230	

LW	13				28		**PRW**	0.701			0.364	
LL	3				22		**Z Stat**	-2.458			-3.101	
Panel B	Sample of 45 funds from July 2001 to June 2005											
	FIRST PERIOD						SECOND PERIOD					
	Alpha	Market	SMB	HML	Timing	R2	C	Market	SMB	HML	Timing	R2
Mean	0.006	0.382	0.111	0.163	-1.518	0.425	0.008	0.368	0.265	0.429	9.046	0.218
Stdev	0.011	0.631	0.452	0.876	4.123	0.21	0.002	0.369	0.052	-0.199	-1.48	0.325
Positive	40 (15)				14 (1)		30 (3)				18 (0)	
Negative	5 (0)				31 (4)		15 (1)				27 (1)	
					Combination over two periods							
WW	26				10		**CPR**	1.238			8.571	
WL	14				4		**CHI**	0.049			9.790	
LW	3				7		**PRW**	1.156			0.444	
LL	2				24		**Z Stat**	0.220			2.939	
Panel C	Sample of 28 funds from July 2000 to June 2005											
	FIRST PERIOD						SECOND PERIOD					
	Alpha	Market	SMB	HML	Timing	R2	C	Market	SMB	HML	Timing	R2
Mean	0.005	0.562	0.072	0.167	-0.48	0.402	0.002	0.383	0.079	-0.29	0.913	0.313
Stdev	0.008	0.713	0.376	0.531	3.683	0.248	0.006	0.382	0.2	0.531	6.789	0.223
Positive	22 (5)				17 (1)		15 (1)				15 (3)	
Negative	6 (0)				11 (4)		13 (0)				13 (0)	
					Combination over two periods							
WW	11				10		**CPR**	0.500			1.714	
WL	11				7		**CHI**	0.527			0.480	
LW	4				5		**PRW**	0.786			0.714	
LL	2				6		**Z Stat**	0.286			0.260	

Having counted the number of WW, WL, LW and LL, we test for stock-picking persistence. Both CPR and CHI show evidence of such persistence. The observed CPR is 0.18 with Z statistic of -2.45, thus significant at the 5% level. The observed value of the CHI statistic is 6.94, again significant at the 5% level. Furthermore, the calculated PRW is 70%, which shows winners generate much of the observed persistence. The results for stock-picking persistence in panels B and C are mixed. CPR and CHI in both panels show no persistence, but PRW shows some evidence of winning persistence. A possible reason why CPR and CHI do not detect persistence is that the number of LL in both panels is very small. Taken

together, the results suggest weak evidence that Australian hedge funds demonstrate persistence in picking stocks, mainly on the winning side.

Looking at market timing, based on signs, only 27 funds in the first group are possibly able to time market movement during the first period, and indeed only three have positive significant market-timing skills at the 5% level. Results for the second period are similar. Across the two sub-periods, 14 funds successfully time market movements (WW), while 22 funds show an inability to avoid successive perverse timing outcomes (LL). The calculated CPR is 0.07, with Z statistic of -3.10; and the calculated CHI is 9.79. Accordingly, both CPR and CHI indicate significant evidence of market timing.

The calculated PRW is 36%, which shows that losers generate much of the persistence observed in market timing. Panel B shows similar results; both CPR and CHI are significant, and PRW is less than 50%. However, in Panel C, both CPR and CHI are insignificant and PRW is 71%. Overall, there is evidence that Australian hedge funds demonstrate persistence in market timing, mainly on the losing side. These results are consistent with Do, Faff and Wickramanayake (2005) who show that Australian hedge funds are quite successful at picking stocks but not at timing markets.

IV. Conclusions

In this paper, we analyze the relative performance persistence of Australian hedge funds for the period July 2000 to June 2005. We apply parametric and non-parametric techniques to test for performance persistence. The parametric approach shows evidence of performance persistence. Our findings show that the magnitude of persistence is greater on the negative side, which means funds are more likely to repeat under-performance.

The non-parametric approach separates funds according to investment strategy and then determines whether they are winners or losers. Persistence exists when a fund stays in the same group for two or more consecutive months. We find that fund of funds are the most

persistent. We also applied the test to all hedge funds and find short-term (monthly) performance persistence.

We also calculated an individual fund's alpha by regressing its returns against those of an aggregate of metric of funds that apply similar investment strategies. The resulting analyses show that long-term performance persistence does not exist among Australian hedge funds as a whole. We also find, however, that based on the percentage of repeating winners, there is weak evidence of long-term winning persistence. When tested for multi-period persistence our findings show weak evidence of multi-period winning. In addition, we also find that it is much stronger on the losing side. This is consistent with the results of our parametric test of short-term performance persistence. Our findings also show weak evidence of stock-picking persistence, mainly on the winning side. We also find some evidence of market-timing persistence, driven mainly by the losing side.

In summary, some strong evidence of short-term performance persistence is documented for Australian hedge funds. However, the results for long-term persistence and multi-period persistence are weak and inconclusive. Australian hedge fund managers are also find to consistently pick outperforming stock but also consistently mis-time the market.

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Appendix 1

Descriptions of Australian Hedge Fund Classes Based on Strategy

Absolute returns:

Aim to produce superior risk-adjusted return by trading a diversified portfolio of developed market currencies using a systematic approach.

Arbitrage strategies:

Seek arbitrage opportunities in domestic and international markets as well as in mergers and acquisitions of Australian listed companies.

Australian long/short-long biased:

Apply a strategy to select securities whose prices do not reflect potential growth. They can short sell 25% of the fund's net value and invest in futures and option markets.

Event-driven strategies:

Focus on merger and capital growth arbitrage opportunities in the Australian equity market.

Fund of funds (FF):

Allocate capital among investment funds with a diversified mix of investment vehicles. This type of fund ensures a greater diversification for investors and allows them to access products offered by other hedge funds.

Global macro:

Attempt to identify mispricing in asset markets by using an integrated global modeling system that captures the independencies between asset markets and other markets within and between the economies.

Long/short strategy:

Select short and long positions to maximize risk-adjusted returns. The funds use their own techniques to select short and long positions. The general target is 40-65% net long.

Managed futures:

Apply statistical techniques to design a trading system that suits fund managers' risk and return profiles. This strategy normally concentrates on established futures markets.

Multi-strategies:

Apply more than one trading strategy mentioned above based on managers' objectives and market conditions.

Note: The above definitions are based on information provided in Hedge Fund Report 2003 by InvestorInfo Ltd.