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### Diseconomies of Scale in the Hedge Fund Industry

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# BNP Paribas Hedge Fund Centre

## Hedge Fund Insights

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### Mission of the BNP Paribas Hedge Fund Centre

The mission of the BNP Paribas Hedge Fund Centre is to facilitate, encourage, and sponsor high-level academic research on hedge funds. The Centre also provides outstanding education to students, executives, and investors, and publishes objective and independent information on hedge funds, while promoting understanding and awareness of alternative investment strategies. Through excellence in research on alternative investments, the Centre is recognized for its capacity to foster stimulating exchange of opinions, and to develop a knowledgeable and objective information base regarding hedge funds.

Specifically, the primary objectives of the BNP Paribas Hedge Fund Centre at the Singapore Management University are to

1. conduct and disseminate high quality academic hedge fund research
2. educate finance practitioners and the investor public on hedge funds, and
3. raise the profile of the hedge fund industry in Asia and Singapore

To achieve these goals, the Centre will collaborate closely with academics at the London Business School. Moreover at all times, the Centre is absolutely committed to the highest ethical conduct and will actively avoid any conflicts of interest with outside parties.

# Diseconomies of Scale in the Hedge Fund Industry

Melvyn Teo<sup>1</sup>

## Executive summary

How does fund size impact fund performance in the hedge fund industry? We find unsurprisingly that fund size crimps both raw and risk-adjusted fund returns for the average hedge fund. An increase in fund assets under management from US\$20m to US\$1bn decreases fund alpha by 2.04 percent per year. However, significant variation exists across funds when funds are grouped by investment strategy and region. Equity long/short, event driven, and macro funds are susceptible to capacity constraints while fixed income and managed futures funds are largely immune to such concerns. Our finding that capacity issues impact macro fund performance raises fresh questions about the liquidity of the assets that macro funds trade. While we find that diseconomies of scale are pervasive across the majority of investment regions examined, it is surprising that funds operating in the Asian and Latin American markets are largely free of such constraints.

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Since the 2008 financial crisis, institutional investors, motivated by career concerns, have eschewed smaller hedge funds and embraced larger, institutional quality hedge funds. These investors probably understand that they are sacrificing some performance when investing in a larger fund. Small funds, either because they are managed by hungrier and more motivated fund managers who want to build a successful track record or because their investment opportunity sets are not yet constrained by the liquidity issues that confront larger shops, are often able to harvest higher returns than their larger competitors. To be sure, not all hedge funds are equally susceptible to such capacity constraints. The conventional wisdom is that macro funds and CTAs, due to the depth of the securities that they trade, and multi-strategy funds, due to their flexible investment mandate, are able to sidestep the diseconomies of scale that plague other hedge funds. In this issue of the Hedge Fund Insight, we measure that performance trade off that investors make when they shun smaller funds for larger ones. We also put conventional wisdom to the test by evaluating capacity constraints for funds sorted by strategy and investment region. We focus on differences in capacity constraints across investment strategies and regions as opposed to variation in those constraints over time for each strategy (see, for example, Naik, Ramadorai, and Stromqvist (2007)).

Our analysis centers on data obtained from the TASS, HFR and BarclayHedge databases and on the 1994-2011 period. We merge these databases by hand using fund name. The sample includes 36,346 funds of which 22,725 stop reporting by the end of the sample period in December 2011, leaving us with 13,621 live funds at the end of the sample period. Of the funds in our combined sample, 8,857 funds are unique to TASS, 7,487 are funds unique to HFR, and 8,207 are funds unique to BarclayHedge.

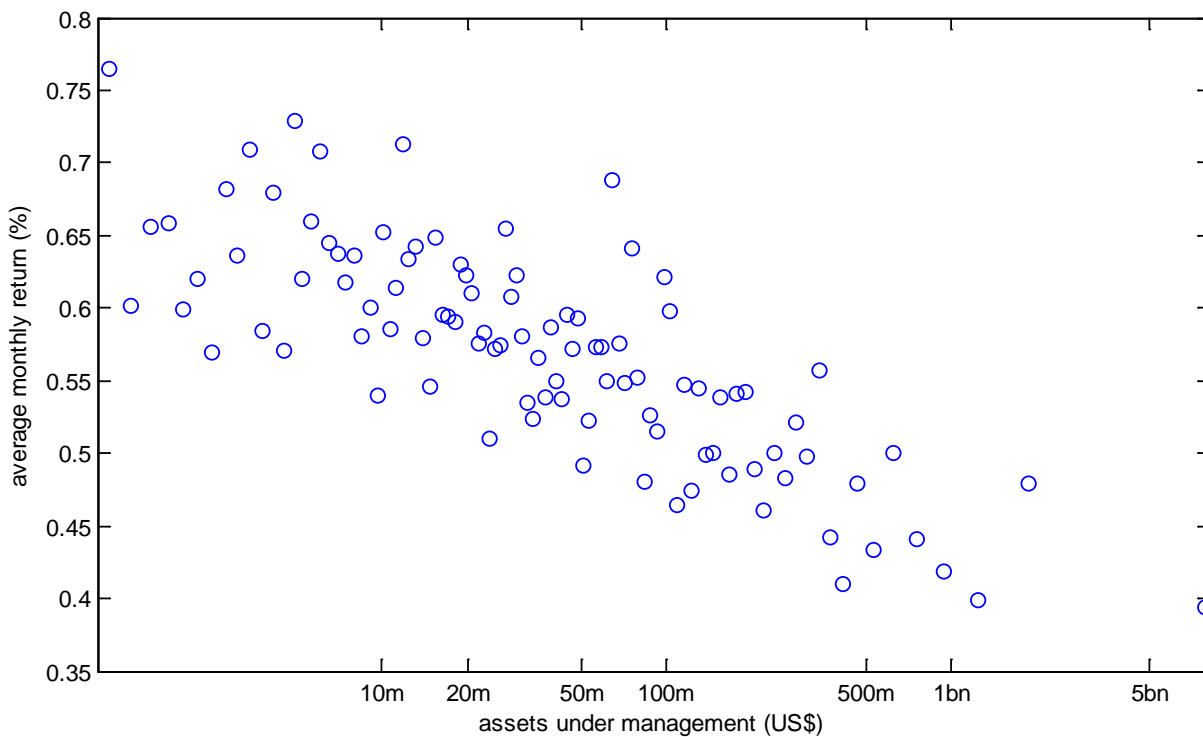
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To understand the nature of capacity constraints amongst hedge funds, we pool hedge fund returns across funds and time. We then sort the fund monthly returns by fund assets under management and gather those returns into 100 groups. Figure 1 plots the average returns of each group against the natural logarithm of the average assets under management of the group. The groups are depicted by bubbles in Figure 1. The pattern of bubbles in Figure 1 reveals that capacity constraints manifest in the full sample of funds. In the first row of Table 1, we present the coefficient estimate from the univariate regression on fund monthly returns with the natural logarithm of fund monthly assets under management as the independent variable. The coefficient estimate indicates that an increase in assets under management from US\$20m to US\$1bn crimps fund annualized returns by 1.62 percent ( $t$ -statistic = -16.59). These baseline results are consistent with the widely held view that hedge funds are susceptible to diseconomies of scale as liquidity concerns make it harder for funds to move significant amounts of capital in and out of financial securities.

Figure 1: The relationship between size and fund performance for the full sample of funds

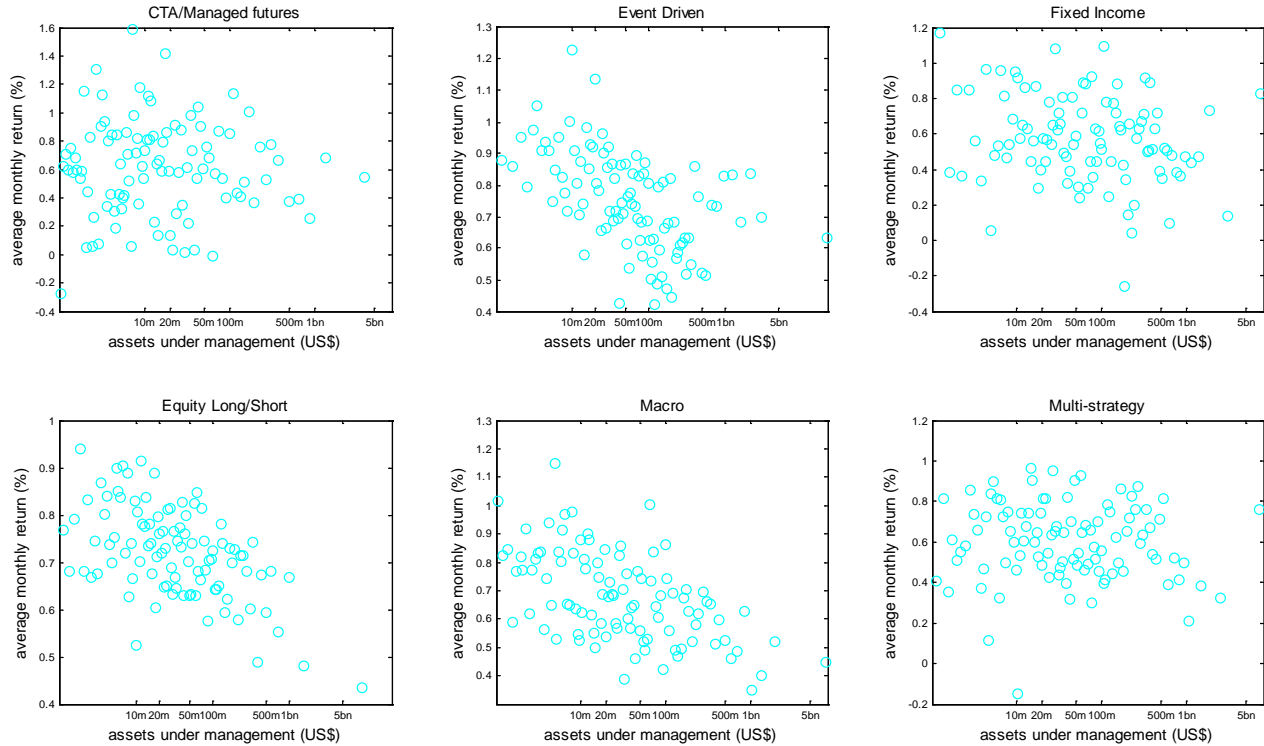


Naturally, some financial markets are deeper and more liquid than others. One would expect the commodity futures markets for instance to be significantly more liquid than the equity market. Therefore capacity issues are likely to be more relevant for equity long/short than for CTAs. To test, we redo the baseline analysis on funds stratified by investment strategy. We analyze the impact of fund size on fund performance for CTAs, event driven, fixed income, equity long/short, macro, and multi-strategy funds. The differences in the relationship between fund size and performance depicted in Figure 2 are striking. For equity long/short, event driven, and macro, there exists a strong downward sloping relation between size and returns. However, the link between assets under management and fund returns is more tenuous for fixed income funds, and virtually non-existent for CTAs and multi-strategy funds. These findings are corroborated by the coefficient estimates reported in the second row of Table 1. On one hand, the results validate the view that some strategies like CTAs operate in a liquid environment and are therefore spared the diseconomies of scale that afflict other hedge funds. On the other hand, the findings raise questions about the liquidity of macro funds who

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supposedly also trade liquid instruments such as major currencies, equity indices, and sovereign bonds.<sup>2</sup> Nonetheless, it is comforting that multi-strategy funds are able to take advantage of their inherent investment flexibility to circumvent the capacity constraints that afflict other hedge funds.

Figure 2: The size and fund performance relationship by investment strategy



When we perform the same baseline analysis on funds stratified by investment region, we find that most of the capacity issues appear confined to US- and Europe-focused funds. From Figure 3 and the third row in Table 1, it is clear that there is a statistically unreliable relationship between size and fund returns for funds focused on the following regions: Asia including Japan, Japan, Global, and Latin America. These results are surprising as the liquidity hypothesis would suggest that funds face greater liquidity constraints in the relatively undeveloped emerging markets of Asia and Latin America. Perhaps larger funds do not underperform smaller funds in such markets as the former expediently take on greater risks thereby increasing their expected returns. To address this issue, it will be important to adjust for risk and examine fund alphas.

<sup>2</sup> Our results may be driven by macro funds that trade illiquid emerging market (non G10) currencies or bonds.

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Figure 3: The size and fund performance relationship by investment geography

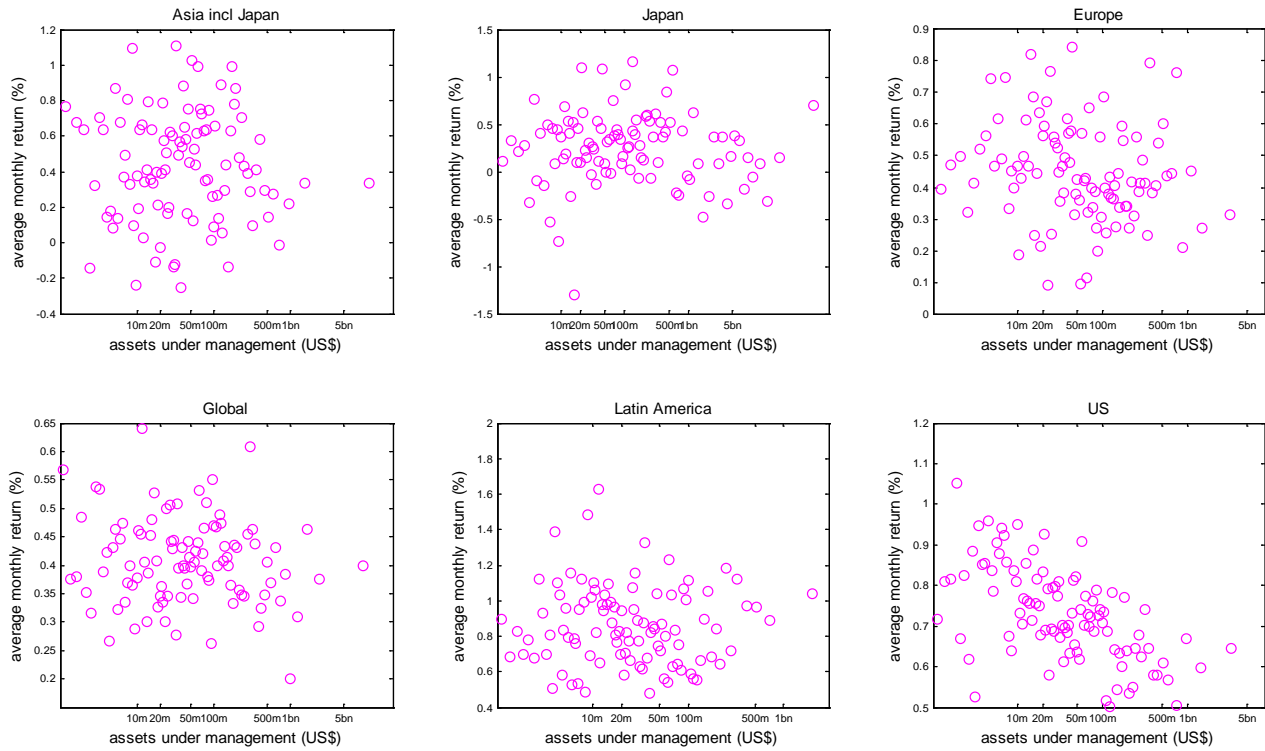


Table 1: Regressions on fund returns

All funds						
Independent variable						
Log(Assets under management)	<b>-0.0346</b>					
	(-16.59)					
Investment strategy						
Independent variable	CTA	Event driven	Fixed income	Equity long/short	Macro	Multi-strategy
Log(Assets under management)	-0.0044	<b>-0.0455</b>	<b>-0.0309</b>	<b>-0.0318</b>	<b>-0.0417</b>	-0.0066
	(-0.25)	(-5.85)	(-2.69)	(-6.47)	(-6.78)	(-0.74)
Investment region						
Independent variable	Asia incl Japan	Japan	Europe	Global	Latin America	US
Log(Assets under management)	-0.0096	-0.0046	<b>-0.0165</b>	-0.0055	-0.0029	<b>-0.0404</b>
	(-0.54)	(-0.34)	(-1.98)	(-1.68)	(-0.24)	(-7.91)

Note: Coefficient estimates that are statistically significant at the 5% level are in bold

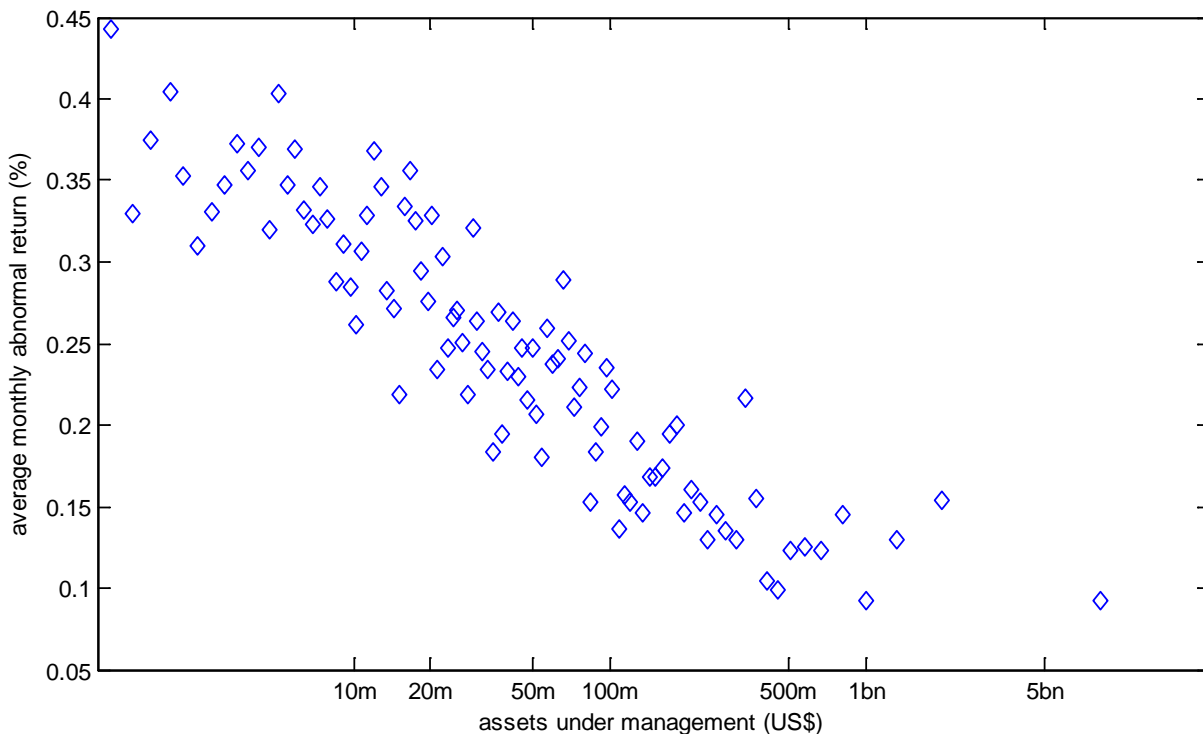
In that effort, we evaluate the performance of hedge funds relative to an augmented Fung and Hsieh (2004) factor model. The Fung and Hsieh (2004) factors include the S&P 500 factor (SNPMRF), the size factor (SCMLC), the term spread (BD10RET), the default spread (BAAMTSY), and trend following factors for bonds (PTFSBD), foreign exchange (PTFSFX), and commodities (PTFSCOM). We include an additional factor derived from the excess return of the MSCI Emerging Markets equity index (MSCIEM) to capture the exposure to emerging market equities in the data. For funds with at least 36 months of returns, we compute fund factor loadings using the full sample of fund performance data. Then, for each month we compute fund monthly

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abnormal/risk-adjusted returns or alpha as the difference between the monthly excess return of the fund (in excess of the risk free rate) and the factor loadings multiplied by the factor realizations.

The relationship between fund size and risk-adjusted returns depicted in Figures 4 and 5 as well as in Table 2 largely echoes that between fund size and raw returns. For the full sample of funds, an increase in fund size from US\$20m to US\$1bn reduces fund alpha by 2.04 percent per year.<sup>3</sup> The relationship is strongest for event driven, equity long/short, and macro, relatively weak for multi-strategy funds, and virtually non-existent for fixed income funds and CTAs. When we examine the link between size and fund alpha for funds grouped by investment region, we find that capacity constraints are no longer confined to US- and Europe-focused funds only as previously thought. Fund alpha decreases with fund size for funds focused on Japan and the Global region as well. Therefore, there is some evidence that large funds operating in these regions take on greater fundamental risk so as to bolster their returns. Still it is surprising that funds in the more illiquid markets such as Asia including Japan and Latin America are relatively unaffected by capacity issues. The coefficient estimates on the natural logarithm of fund assets under management are statistically indistinguishable from zero (at the 5% level) in the fund alpha regressions for Asia including Japan- and Latin America-focused funds. Perhaps in these markets, capacity constraints are counter balanced by the smart money effect where investors astutely allocate capital to funds that subsequently perform well.

Figure 4: The relationship between size and fund risk-adjusted performance for the full sample of funds



<sup>3</sup> Inferences remain unchanged when we control for backfill bias by removing the first 12 months of returns for each fund, when we control for year fixed effects in the regressions, or when we include additional risk factors constructed from the MSCI Asia including Japan and MSCI Latin America equity indices in the risk-adjustment model.

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Figure 5: The size and fund risk-adjusted performance relationship by investment strategy

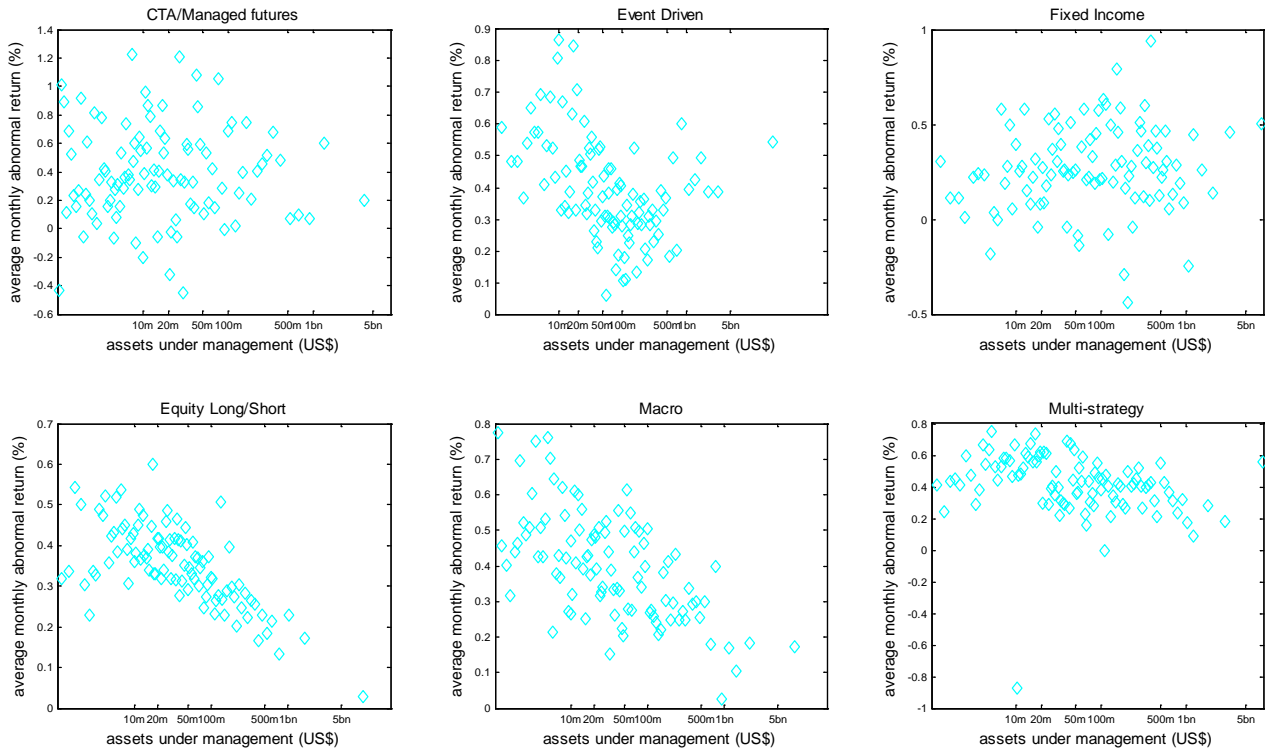
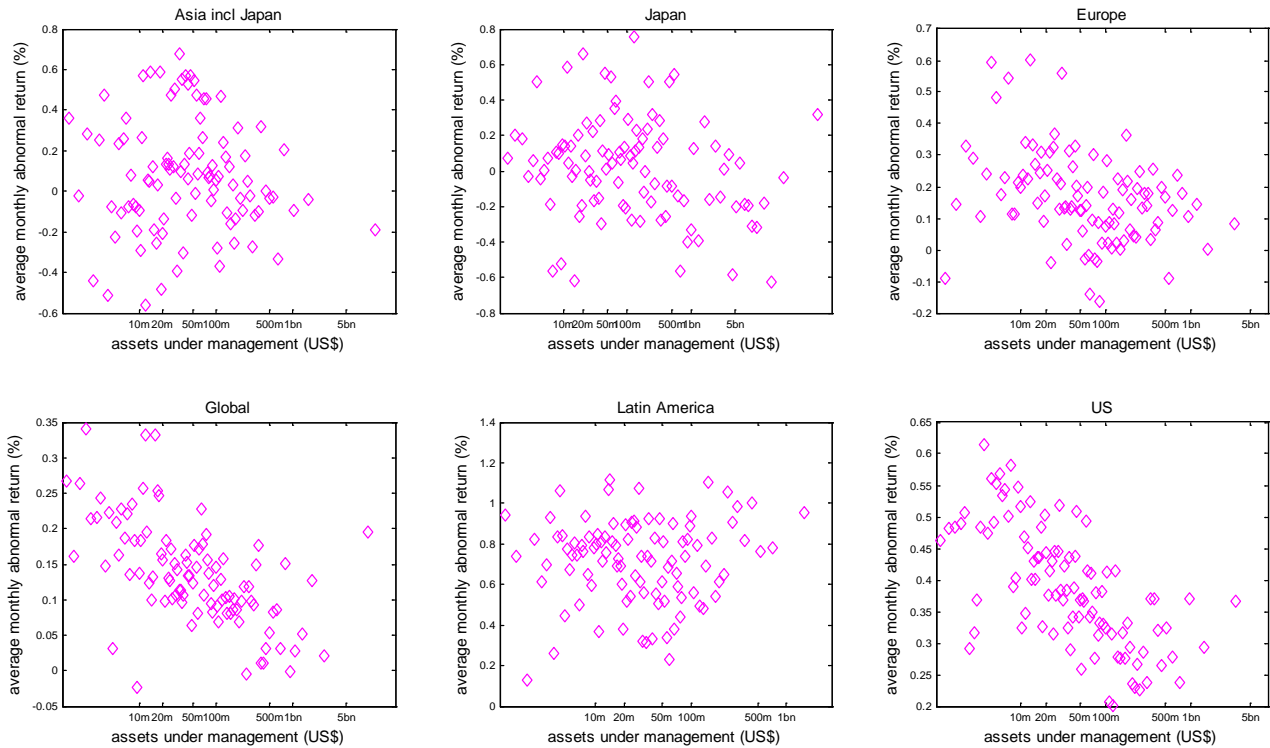


Figure 6: The size and fund risk-adjusted performance relationship by investment region





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Table 2: Regressions on fund alpha

Independent variable	Investment strategy					
	CTA	Event driven	Fixed income	Equity long/short	Macro	Multi-strategy
Log(Assets under management)	-0.0019 (-0.11)	<b>-0.0385</b> (-6.04)	0.0153 (1.43)	<b>-0.0399</b> (-10.49)	<b>-0.0495</b> (-7.74)	<b>-0.0267</b> (-3.51)
Independent variable	Investment region					
	Asia incl Japan	Japan	Europe	Global	Latin America	US
Log(Assets under management)	-0.0144 (-1.04)	<b>-0.0261</b> (-2.11)	<b>-0.0316</b> (-4.53)	<b>-0.0241</b> (-8.59)	0.0096 (0.86)	<b>-0.0377</b> (-9.36)

*Note: Coefficient estimates that are statistically significant at the 5% level are in bold*

### Conclusion

In the wake of the global financial crisis of 2008, many institutional investors motivated by career concerns have flocked to the safety of large billion dollar hedge funds. Our results serve as a gentle reminder to fund investors of the returns that they are sacrificing in their flight to perceived safety. Of course it is important not to tar all hedge funds with the same brush. The empirical results confirm the conventional wisdom that managed futures and fixed incomes fund are able to circumvent capacity constraints due in part to the liquidity of their underlying investments. Similarly, multi-strategy funds are able to take advantage of their flexible investment mandate to overcome capacity issues that handicap their equity long/short and event driven counterparts. However, with macro funds, the conventional wisdom does not hold. Our results indicate that size hampers the investment performance of macro funds, raising questions about the liquidity of the assets and instruments that they trade.

### References

- Fung, W., Hsieh, D., 2004. Hedge fund benchmarks: a risk based approach. *Financial Analyst Journal* 60, 65–80.
- Naik, N., Ramadorai, T., Stromqvist, M., 2007. Capacity constraints and hedge fund strategy returns. *European Financial Management* 13, 239-256.

# Update on the Centre's Activities

## Research

The hedge fund centre will be awarding research grants to the following three papers:

1. How skilled are hedge funds? Evidence from their daily trades, by Russell Jame (UNSW)
2. The role of hedge funds in the security price formation process, by Charles Cao (Penn State), Yong Chen (Texas A&M), William Goetzmann (Yale), and Bing Liang (University of Massachusetts)
3. Momentum strategies in futures markets and trend following funds by Akindynos-Nikolaos Baltas (Imperial College) and Robert Kosowski (Imperial College)

These papers, as well as other research papers sponsored by the centre, are available on our research website:

<http://www.smu.edu.sg/centres/hfc/research.asp>

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For more information regarding the BNP Paribas Hedge Fund Centre at SMU and our upcoming activities, please contact Ms Karyn Tai, centre coordinator (Tel: +65-6828-0933, E-mail: [hfc@smu.edu.sg](mailto:hfc@smu.edu.sg)) or visit our webpage at <http://www.smu.edu.sg/centres/hfc/index.asp>. We look forward to receiving your suggestions and comments.