

# THE ALPHA-BETA Divide



Hedge fund replication bridges  
the gap between hedge funds  
and plan sponsors.

BY ANDREW W. LO

**A**s institutional investors take a more active interest in alternative investments, a significant gap has emerged between the culture and expectations of those investors and hedge fund managers. Pension plan sponsors typically require transparency from their managers and impose a number of restrictions in their investment mandates because of regulatory requirements such as ERISA rules; hedge fund managers rarely provide position-level transparency and bristle at any restrictions on their investment process because restrictions often hurt performance.

Plan sponsors require a certain degree of liquidity in their assets to meet their pension obligations, and also desire significant capacity because of their limited resources in managing large pools of assets; hedge-fund managers routinely impose lock-ups of one to three years, and the most successful managers have the least capacity to offer, in many cases returning investors' capital once they make their personal fortunes.

And as fiduciaries, plan sponsors are hypersensitive to the outsize fees that hedge funds charge, and are concerned about misaligned incentives induced by performance fees; hedge-fund managers argue that their fees are fair compensation for their unique investment acumen, and at least for now, the market seems to agree.

This cultural gap raises the natural question of whether it is possible to obtain hedge fund-like returns without investing in hedge funds. In short, can hedge fund

returns be “replicated” by passive investments in liquid exchange-traded instruments?

## EMPIRICAL EVIDENCE

The short answer is “no.” The empirical evidence suggests that only a portion of a typical hedge fund’s average return can be attributed to the risk premia from market indexes such as the S&P 500, the Lehman Bond Index, and the U.S. Dollar Index. For example, using a linear five-factor model to construct replicating portfolios for individual hedge funds in the TASS database, Hasanhodzic and Lo (2007) find that the average of the annualized mean returns of replication strategies for Emerging Market funds is 5.17%, which is considerably lower than the 21.12% average annualized mean return for the funds themselves. This large gap is understandable, given the illiquidity premium that investors earn from emerging market securities. This illiquidity premium will clearly be missing from a replication portfolio consisting of liquid securities; hence we should expect a significant performance gap in this case.

However, for other categories, the average expected return of the replication strategies is only slightly lower than that of their fund counterparts. For example, the average mean return of Equity Market Neutral replication strategies is 4.43%, and the corresponding figure for the sample of funds is 5.71%. For the Long/Short Equity Hedge category, the average mean return for replication strategies and funds is 9.08% and 11.90%, respectively. And in the Fund of Funds category, the average mean

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return for replication strategies and funds is 5.67% and 7.34%, respectively. Table 1 contains a more complete summary of the differences between replication strategies and hedge funds, which suggests that certain types of hedge-fund strategies may be more amenable to replication than others.

The risks of replication strategies may differ from those of hedge funds, but a comparison of the average Sharpe ratios of replication strategies and funds shows a similar pattern: for some categories, replication strategies significantly underperform their fund counterparts, and for other categories, the replication strategies capture a significant portion of the category's risk-adjusted return (see Figure 1).

## WHY REPLICATION?

If the empirical evidence is that at best, replication strategies approximate the expected returns of certain types of hedge funds, and at worst, they yield only a small fraction of a hedge fund's expected return, why should any institutional investor be interested in replication? There are, in fact, at least five compelling reasons:

**1. Capacity and Liquidity.** Because replication strategies are based on liquid exchange-traded instruments such as futures contracts, they have significantly higher capacity than hedge funds and fund of funds. Moreover, by construction, they are also more liquid; hence, investors can change their exposures to these strategies quickly and opportunistically.

## REPLICATION STRATEGY PERFORMANCE

Table 1

Performance comparison of 24-month rolling-window linear replication strategies of hedge funds in the TASS Live database and their corresponding funds, from February 1986 to September 2005.

24-Month Rolling-Window Linear Replication											
Category Description	Sample Size	Annual Mean Return (%)		Annual SD (%)		Annual Sharpe		p1(%)		p-value (Q <sub>5</sub> ) (%)	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<b>Funds</b>											
Convertible Arbitrage	82	4.04	7.83	5.76	4.55	2.31	8.96	42.3	16.2	12.4	19.4
Dedicated Short Bias	10	2.58	7.19	25.91	14.20	0.02	0.42	8.3	5.5	31.9	19.0
Dedicated Short Bias*	9	1.42	6.55	26.21	15.03	-0.04	0.39	7.4	4.9	35.2	16.8
Emerging Markets	102	21.12	13.86	19.95	14.06	1.74	2.57	16.0	14.3	39.2	28.1
Equity Market Neutral	83	5.71	4.14	6.60	5.91	1.44	1.68	5.3	24.0	40.2	33.9
Event Driven	169	11.65	10.45	7.62	7.68	2.01	1.43	17.2	17.8	31.1	29.8
Fixed Income Arbitrage	62	7.80	7.59	5.73	4.52	2.17	1.81	23.3	21.4	30.1	32.4
Global Macro	54	9.01	6.72	11.16	6.50	0.91	0.73	6.6	18.9	44.7	31.2
Long/Short Equity Hedge	520	11.90	8.93	13.90	8.69	1.04	0.77	9.8	16.7	42.0	28.5
Managed Futures	114	11.84	8.82	20.19	10.94	0.66	0.52	4.0	14.9	37.0	28.3
Multi-Strategy	59	8.97	6.13	7.65	10.10	1.86	1.25	18.3	22.5	29.1	28.6
Fund of Funds	355	7.34	3.95	5.68	4.29	1.67	0.97	22.6	16.3	24.0	26.5
All Except Fund of Funds	1255	11.15	9.86	12.38	10.12	1.38	2.64	13.5	19.8	36.6	29.8
<b>Linear Replication Strategies</b>											
Convertible Arbitrage	82	2.78	4.95	6.20	6.57	0.71	0.77	6.4	12.7	43.8	29.1
Dedicated Short Bias	10	6.83	16.18	29.31	15.61	0.09	0.45	0.4	8.8	36.7	28.7
Dedicated Short Bias*	9	9.08	15.41	30.00	16.39	0.17	0.40	-0.7	8.5	36.8	30.4
Emerging Markets	102	5.17	14.70	25.04	17.94	0.47	0.66	7.7	12.4	42.5	27.3
Equity Market Neutral	83	4.43	4.90	7.91	6.49	0.64	0.68	4.2	12.7	47.8	27.0
Event Driven	169	6.96	8.33	7.79	7.10	1.05	0.56	3.0	13.3	39.6	27.3
Fixed Income Arbitrage	62	4.47	4.63	6.85	5.17	0.84	0.71	4.3	9.9	40.8	30.0
Global Macro	54	12.97	8.90	12.48	7.38	1.08	0.59	4.1	11.1	45.3	28.2
Long/Short Equity Hedge	520	9.08	11.03	15.83	10.64	0.76	0.68	0.3	15.6	42.5	29.1
Managed Futures	114	19.24	13.32	22.96	13.71	0.91	0.57	5.5	10.9	46.5	27.7
Multi-Strategy	59	5.33	7.52	9.16	9.59	0.71	0.60	0.8	13.0	35.9	28.2
Fund of Funds	355	5.67	4.57	6.22	5.40	1.11	0.54	0.0	13.0	39.8	28.5
All Except Fund of Funds	1255	8.42	11.06	14.20	12.14	0.79	0.67	2.8	13.9	42.6	28.4

\*Fund 33735 has been dropped from this sample of the Dedicated Short Bias funds.

Source: Hasanhodzic and Lo (2007).

**2. Capital Efficiency.** The inherent leverage built into most futures contracts implies that only small amounts of capital are required to implement a typical replication strategy, much like an S&P 500 futures overlay. For example, a multi-strategy replication product with an annualized return volatility of 5% for a \$100MM notional account may require as little as \$5MM to \$10MM of cash to implement.

**3. Transparency and Customizability.** Replication strategies are easily implemented in separately managed accounts, and are therefore completely transparent and readily customizable. For example, if an investor seeks to replicate the class of Multi-Strategy funds in the TASS data but prefers as little equity exposure as possible, replication strategies for funds in this category can be constructed.

**4. Simplicity and Cost.** The simplicity of replication strategies implies that active-management and incentive fees are unnecessary and inappropriate. A plausible upper bound for the management fees of such strategies is 100 basis points, and over time, this should decline considerably as more asset managers and investors develop the expertise for implementing such products and services.

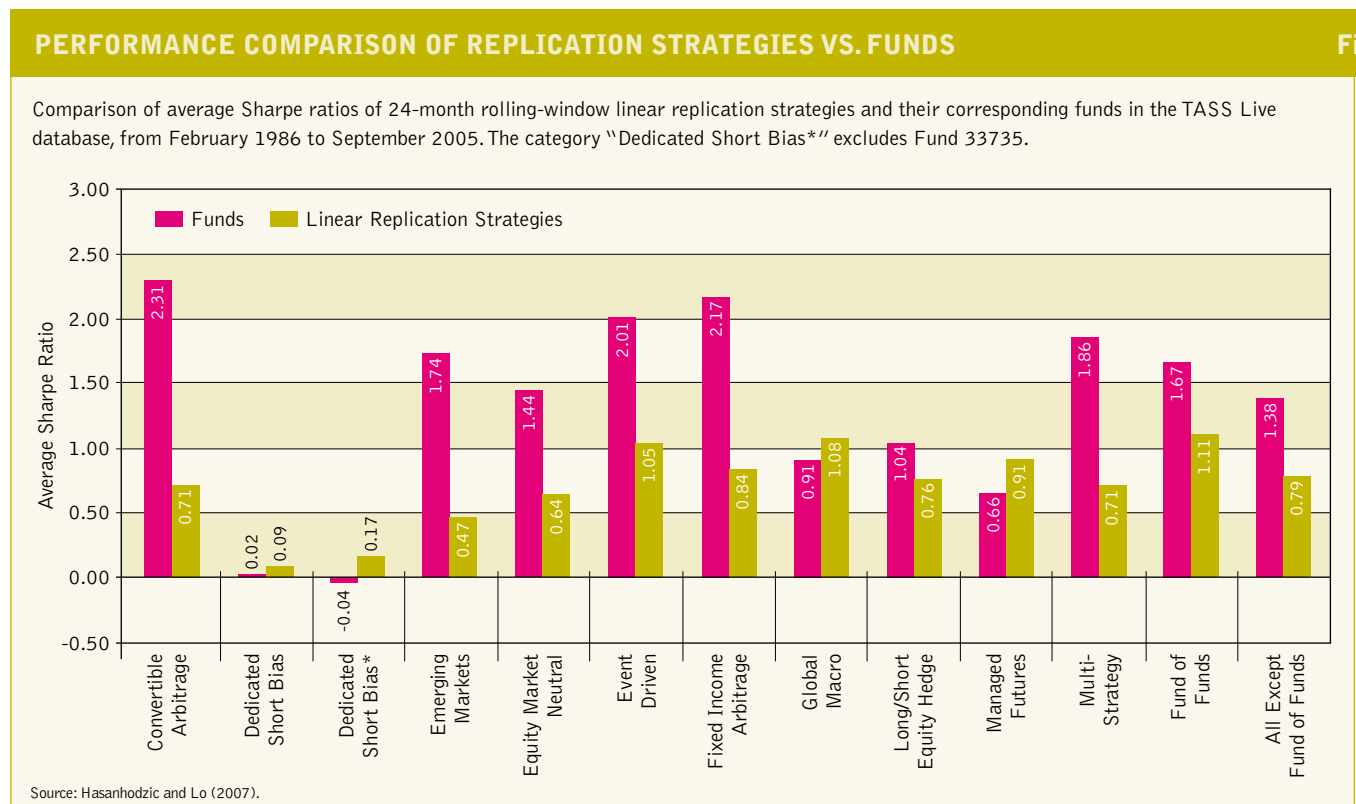
**5. Diversification.** Perhaps the most compelling reason for including replication strategies in an investor’s portfolio is the diversification benefits they provide. The

fact that replication strategies include both long and short positions provides significant hedging potential, and the use of non-traditional factor exposures such as currencies, commodities, and volatility yields even more diversification benefits. Hasanhodzic and Lo (2007) provide a forceful illustration of these potential benefits by comparing the correlations of an equal-weighted portfolio of replication strategies to standard market indexes with those of an equal-weighted portfolio of hedge funds. The results in Table 2 show remarkably similar correlation patterns for the two portfolios, implying that a significant portion of the diversification benefits of hedge funds can also be obtained through replication strategies.

These reasons suggest that despite their lower average returns, replication strategies may have enough advantages over hedge funds to earn them a place in every institutional investor’s portfolio.

## CONCLUSION

A portion of every hedge fund’s expected return is risk premia—compensation to investors for bearing certain risks. An important benefit of hedge-fund investments is the non-traditional types of risks they encompass, such as currency risk, commodities risk, and volatility risk. Most investors would do well to take on small amounts of such risks if they are not already doing so, because these factors



usually yield attractive risk premia, and many of these risks are not highly correlated with those of traditional long-only investments. Although talented hedge-fund managers are always likely to outperform passive buy-and-hold portfolios, the challenges of manager selection and monitoring, the lack of transparency, the limited capacity of such managers, and the high fees may tip the scales for the institutional investor in favour of replication strategies. In other words, portable beta may be an alternative to portable alpha.

As encouraging as the empirical results may be, a number of qualifications must be kept in mind. First, despite the promising properties of linear replication strategies in several style categories, it is well known that certain hedge-fund strategies contain inherent nonlinearities that cannot be captured by linear models (see, for example, the case of Capital Multiplication Partners in Hasanhodzic and Lo, 2007). Therefore, more sophisticated nonlinear methods—including nonlinear regression, regime-switching processes, and stochastic volatility models—may yield significant benefits in terms of performance and goodness-of-fit. However, there is an important trade-off between the goodness-of-fit and complexity of the replication process, and this trade-off varies from one investor to the next. As more sophisticated replication methods are used, the resulting replication strategy becomes less passive, requiring more trading and risk-management expertise, and eventually becoming as complex as the hedge-fund strategy itself.

Third, the replicating factors considered in Hasanhodzic and Lo (2007) are only a small subset of the many liquid instruments that are available to the institutional investor. By expanding the universe of factors to include options and other derivative securities, and customizing the set of factors to each hedge-fund category (and perhaps to each fund), it should be possible to achieve additional improvements in performance, including the ability to capture tail risk and other nonlinearities in a buy-and-hold portfolio. In fact, Haugh and Lo (2001) show that a judiciously constructed buy-and-hold portfolio of simple put-and-call options can yield an excellent approximation to certain dynamic trading strategies, and this approach can also be used to create better replication strategies.

Finally, a number of engineering issues remain to be resolved before hedge fund replication strategies become a reality, e.g., the estimation methods for computing replicating portfolio weights, the optimal rebalancing interval, the types of strategies to be replicated, and the best method for combining replication strategies into

## HEDGE FUNDS VS. REPLICATION

Table 2

Correlations with major market and hedge-fund indexes of equal-weighted portfolios of hedge funds and corresponding linear five-factor 24-month rolling-window replication strategies using the TASS Live database, from February 1986 to September 2005.

Index	Funds	Replication Strategies
S&P 500 Index	41	52
MSCI World Index	28	37
Russell 1000 Index	41	52
Russell 2000 Index	42	37
NASDAQ 100 Stock Index	35	41
BBA LIBOR USD 3-Month	-11	-13
DJ Lehman Bond Comp GLBL	6	24
US Treasury N/B	-8	-17
Gold (Spot \$/oz)	3	3
Oil (Generic 1st 'CL' Future)	0	15
U.S. Dollar Spot Index	13	4
<b>Five Risk Factors:</b>		
CREDIT	13	16
USD	-4	-9
BOND	14	30
SP500	41	52
DVIX	-20	-38
CMDTY	8	21
<b>CS/Tremont Hedge-Fund Indexes:</b>		
All Funds	83	56
Convertible Arbitrage	44	31
Dedicated Short Bias	-67	-66
Emerging Markets	69	50
Equity Market Neutral	48	43
Event Driven	75	61
Fixed Income Arbitrage	34	23
Global Macro	58	35
Long/Short Equity Hedge	80	59
Managed Futures	18	-9
Multi-Strategy	21	3

Source: Hasanhodzic and Lo (2007).

a single portfolio. However, these challenges are all quite manageable given the current array of financial technologies at our disposal, so investors have reason to be optimistic about the practicality of replication strategies in the near term. ■

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