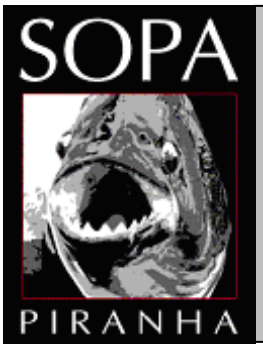


Sopa Piranha*

"Hedge Fund Quantitative Fads and Fallacies"
January 24, 2007 Issue #14

Quarterly Commentary: Sopa Piranha is a market commentary and not a quantitative research tome. Lately I have spent considerable space on quantitative analysis. I promise this is the last quant tome for a while. My topic is measurement of hedge funds or fund of funds using quantitative sorting. The topic is **useful for allocating capital in a multi - strategy fund as well as for those clients looking at individual hedge funds.** The sheer volume of hedge funds has made it necessary to improve our quantitative methods. Good methods can radically reduce error as well as provide better ways of communicating with clients. This is especially true of large institutional clients that tend to use traditional measurement techniques to determine success in hedge funds. **When good quantitative methods are blended with discretionary judgment, the result is a higher probability of profit.**

In this Sopa I specifically focus on a systematic approach for assessing managers' abilities to implement **a synthetic market call. This is the equivalent of a floating bond-like strategy in difficult environments combined with an equity strategy in up markets.** Though I talk throughout this piece in the context of fund-of-funds, the methodology applies equally well for allocating capital in a trading portfolio or at the hedge fund level.

Section One- What are the Primary Sources of Return in Hedge Funds? There are four; 1) portable alpha, 2) variable beta, 3)random beta, and 4) variable leverage. **These sources of return are the components of the market call, a concept I describe in detail before delving into the four above sources of return.**

I personally invest all of my money into a long list of hedge funds. I pay a premium in fees because I receive back an option-like structure (a call) that is worth paying for. **Premiums buy me superior management, intelligent use of leverage, short positions, and the utilization of a synthetic derivatives** investment style. Derivatives in the form of options contracts come with two major advantages over pure long/short positions. The first advantage is that of leverage; for the price of the option premium, which is only a fraction of the full buy-in value, I can realize full buy-in value gains if my contract expires in the money. The second advantage of options comes to my aid if the contract expires out of the money. In such a case I've only lost my option premium; my P and L

does not reflect potential substantial losses in the equity underlying the option contract. No instrument could be more ideal; the maximum downside is known a priori and the upside is unlimited. In the case of hedge funds, I get an income producing call.

Options pricing is a well-established field. The option premium from a Black-Scholes model reflects volatility, time to expiry and the price of the underlying security relative to the contract strike price. **In a synthetic market call option - the product of a skilled hedge fund manager - an incentive fee is directly analogous to an option premium with one exception: for good managers, the incentive fee is cheap relative to an equivalent option premium.**

What, then, should I look for in a portfolio of hedge funds? I look for a collection of uncorrelated funds that emulate market call options. If the funds are in fact uncorrelated, I've created a portfolio with a high probability that at least some of the 'options' will trade in the money; those that don't will still produce bond-like returns. **Since it's not always possible to find a collection of managers implementing the market call with success, a fund of funds will often dynamically allocate to bond-like and stock-like instruments to achieve the market call at the fund of funds level. This is what we do in some of our funds.**

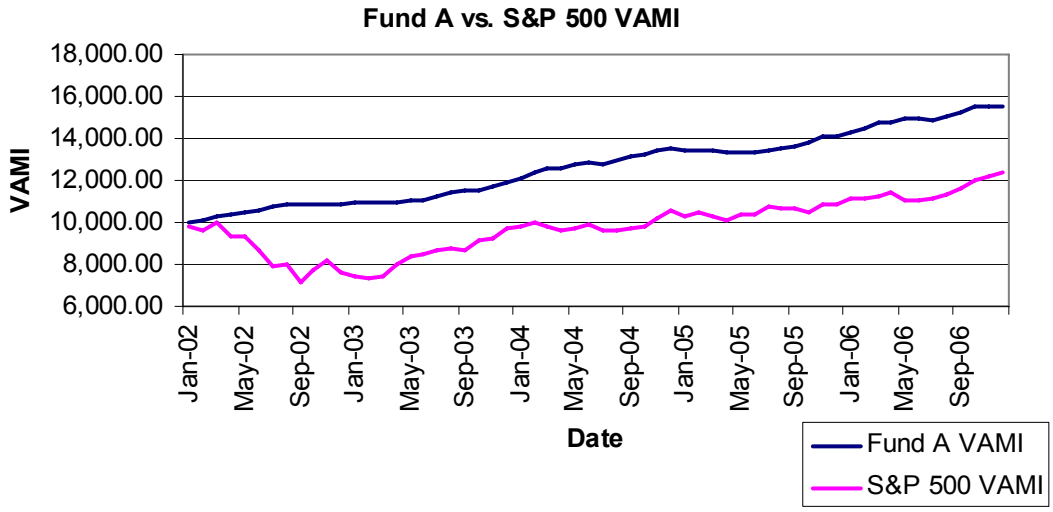
I turn now to the four sources of return mentioned above that make up the call. Most people focus on two only, alpha and beta. The assumption is that beta can be measured and that if it aint beta it must be alpha. This is both false and dangerous as we shall see.

I. Portable Alpha. An index tracking fund, such as an S&P futures ETF, is – by definition – a pure beta fund. Market neutral hedge funds are specifically designed to be beta neutral – that is, to have no correlation to the S&P or any other general market index. If, for the sake of simplicity, we assume that returns above the risk-free rate are comprised simply of the sum of beta and alpha, then a market-neutral – or zero-beta – fund is a "pure alpha" fund. "Portable alpha" is synonymous with "investor talent" in the hedge fund industry, but there are two points worth making about the limitations of portable alpha.

1. **Hidden beta masquerades as portable alpha.** When the investable universe of a fund is far different from the names in a benchmark index, a fund will reveal little beta when compared with that index. As an extreme – even if slightly ridiculous – example consider using the Nikkei as the beta benchmark for a fund that is predominantly long S&P names. A beta calculation will reveal the manager of this ETF-like fund to have a high-alpha, low-beta strategy merely because the benchmark is entirely inappropriate. Clearly in reality the problem is far more insidious, resulting for

example from a sector- or geography-heavy fund using too generic a benchmark for its calculations.

2. **"Beta wash" leads to overestimation of alpha, underestimation of beta.** In a previous Sopa publication on wavelets (issue #13), I focus on the time-dependency of correlations in factor models, noting that measuring correlation across a fixed window of time can avoid deceptive results that come from using fixed-window measurements. Beta and alpha values, which come from correlation and residual calculations, are also highly dependent upon time windows. Contrast the time periods for the below example fund calculated from the entire track and for the bull market from May '03 to December '06.



A review of the track against the S&P benchmark reveals that implementation of the market call comes from being uncorrelated to the market when it is bearish and more correlated when it is bullish. Beta and alpha calculations over two different time windows are as follows:

	Beta	Alpha
Entire Track Period (Jan '02 - present)	**0.01**	**0.0073**
Bull Market (May '03 - present)	**0.12**	**0.0067**

Measured over the entire track, beta is near-zero. Measured over the bull market period, beta is over 10 times as prevalent. **The choice of time window for alpha and beta calculations drastically affects the outcome of the measurement. Resulting**

"beta wash" is an underestimation of variable beta and overestimation of alpha.

II. **Variable Beta.** If, as in the above example of a trending market, we understand that positive beta is good in a bull market, **we're lead to see through the hype of "pure alpha" funds and to accept the merits of funds that can introduce beta during market trends.** Tapping into the market when it is bullish and hedging out with a beta-neutral long/short book when it is side-trending is the mantra of hedge fund managers. Even with partial success in this skill, managers who use variable beta can produce superior returns over a fixed-beta portfolio.

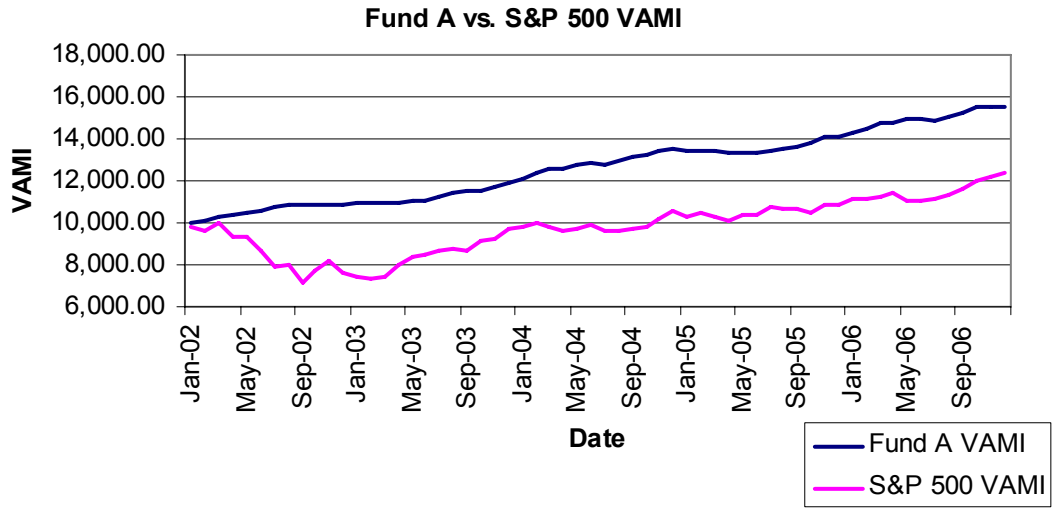
In an upcoming section I discuss variable leverage. It is worth noting here that variable beta and variable leverage are not always distinguishable. **A manager may apply variable leverage across time to a consistent universe of stocks or allocate to higher beta stocks with the same effect.**

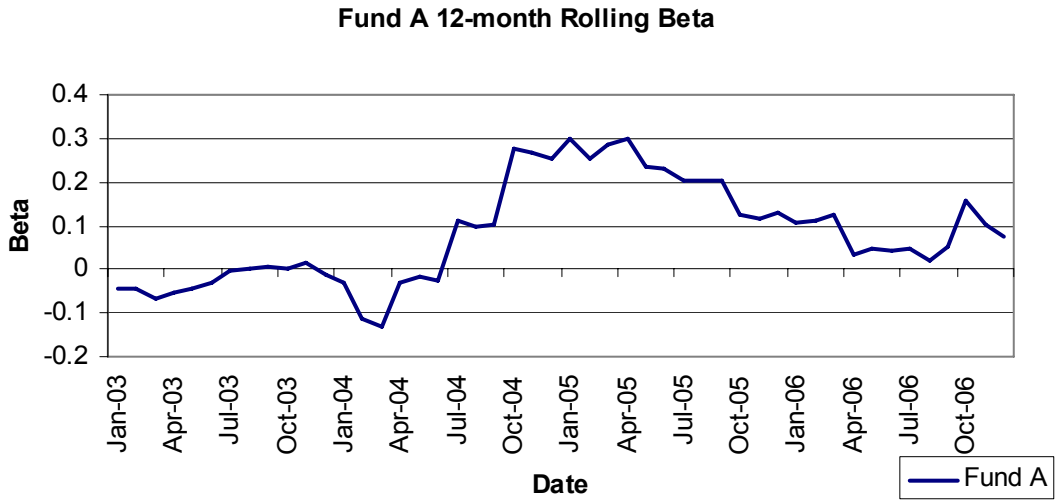
III. **Random Beta.** Though sometimes we intentionally exploit beta in fund selection, beta can also appear from random market dynamics. This **random beta**, as I call it, can appear in spite of a manager's best beta hedge attempts. The simplest explanation for random beta is this: most funds are characterized by only a handful of market factors that drive P&L. These factors aren't necessarily tangible sector or geographic exposures; they may be statistical factors such as those derived from PCA (see last quarter's *Sopa*). **These factors may, from time to time and with no obvious economic drivers, become highly correlated with the market as a whole.** When this happens, random beta has appeared.

The best hedge against random beta is diversification, which is most easily obtained through a fund of funds investment. At the single-fund manager level, random beta is not easy to distinguish from variable beta (an intentional attempt to capture beta).

The below example fund performs consistently well during market upswings and downswings, and consequently its beta is highly variable. A 12-month rolling beta chart shows that fund beta is negative during the '02 bear market, turning positive in the latter part of '04 as the bull market is strong.

In this example we might quickly commend the manager for his application of variable beta. However, only with a consistently good track record can we convince ourselves that the manager has controlled beta and isn't haphazardly benefiting from random beta. In Section III I present a novel approach to revealing variable vs. random beta.





IV. Variable Leverage. Variable leverage is another valuable tool at the disposal of hedge fund managers. Managers looking to increase expected returns during a high-volatility environment will lever up when volatility is high, making opportunities rich and lever down when volatility is low and opportunities are thin. If a manager's hit rate in a high-vol environment is high, increasing leverage in such an environment can really cause the fund to pop.

In January 2004 I wrote a Sopa specifically dedicated to leverage. I invite you to reference the publication for a comprehensive treatment on the topic, but I re-iterate here some important points from that piece. The primary point worth re-stating is that **use of leverage must be earned as a result of good performance.** I've already stated that if a manager's hit rate is high in a high-vol environment, increasing leverage can produce superior returns. The key here is that hit rate is a measure of good performance. Since increasing leverage will amplify signal and noise,

application of leverage in a random walk will indiscriminately amplify profit and loss. If a manager can already mitigate drawdowns and maximize up months through use of variable beta and portable alpha, then leverage will work to his advantage.

Note, however, that leverage adds to risk more than its magnification effect increases return. Due to transaction costs and the impact of poor liquidity at higher levels of leverage, leverage must be well-managed to improve risk-adjusted return before fees.

Section Two- What Are Some Market Measurements and What Do They Say Are Sources of Benefit? Knowing what characteristics I want from a manager and knowing how to measure those characteristics are two different things. In this section I focus on metrics in the hedge fund and FoF industry that help me to recognize funds that are worth my investment. **When used in aggregate, these metrics can give me a rough feel for how well a manager implements the market call. Refining my understanding of the manager's implementation, as I discuss in Section III, requires qualitative insight.**

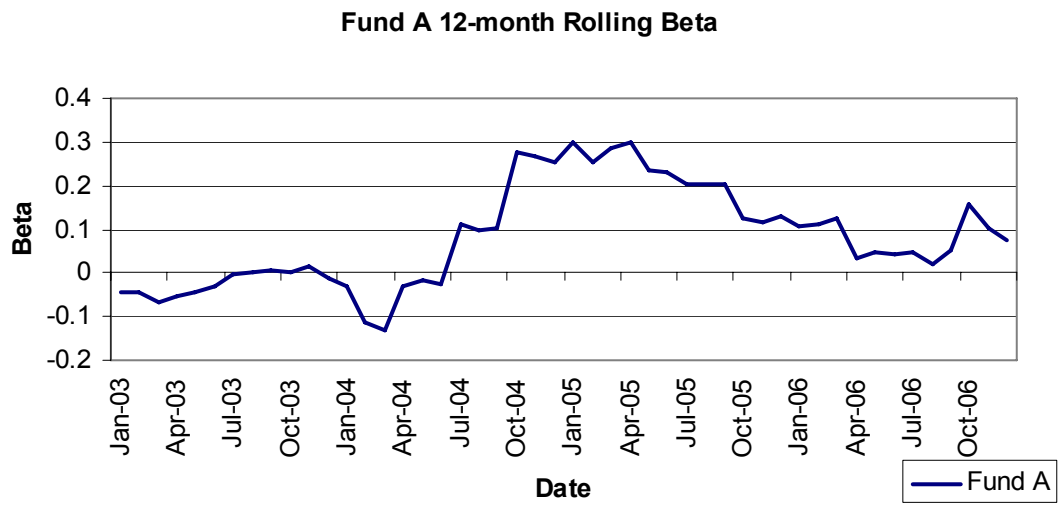
I. Alpha and Beta. In spite of the fact that alpha and beta are the most-touted metrics in fund analysis, they are the most difficult to measure accurately. The calculation itself is not difficult but its accuracy is heavily dependent upon use of an appropriate benchmark. In Section One I explained that use of a benchmark with names not substantially overlapping the fund's investable universe is nonsensical. Finding the 'right' benchmark isn't trivial, particularly for diverse portfolios such as funds of funds. **Creating a custom benchmark is likely going to lead to over-estimation of beta, whereas using one of the many existing indices is likely to underestimate beta.** Since it is easier to use an existing index for beta calculations, the underestimation of beta often leads people to *overestimate* alpha.

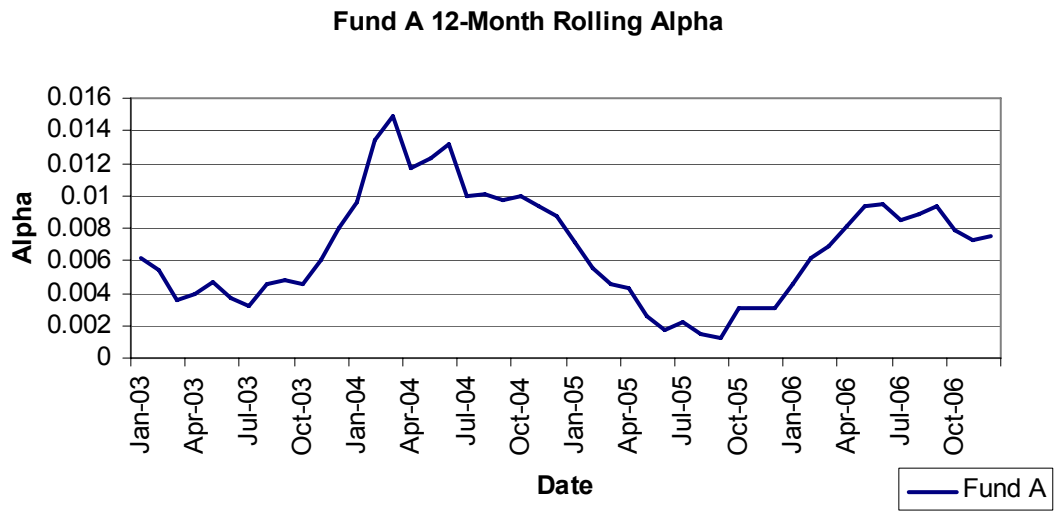
A common but highly over-simplified rationale in alpha calculation is that excess returns come from the simple summation of alpha and beta. We must remember that in hedge fund and fund-of-funds calculations hidden beta comes from the inevitable inadequacy of most any index we use as a benchmark.

While bearing in mind that alpha will likely be overstated, we nonetheless use the simplified notion of alpha as returns not explained by index beta. Note that we cannot calculate hidden beta. Hidden beta is appropriately named; if I knew how to find it through use of a better index, I would obviously choose that index.

From the simplified alpha/beta calculation come rolling alpha/beta charts that reveal variable beta or variable leverage. From the chart alone I cannot distinguish variable beta from variable leverage; an

increase in fund beta could come from a shift to higher-beta stocks or it might come from increased leverage in a fixed pool of stocks. I also cannot untangle variable beta from random beta. Only with a thorough assessment of a manager's track record and associated market conditions can I start to recognize whether a manager methodically introduces beta or happens upon it accidentally.





Manager style drift may also introduce apparent alpha that is, in fact, a beta shift. Managers will invariably use the same benchmark in reports for consistency. If in a first report a manager uses the S&P for beta (and consequently alpha) calculations, he will continue to use the S&P. A

common theme, however, is an increasing overseas allocation within funds. The portfolio may still measure itself against the S&P for consistency and show a decreasing beta – with resulting increase in alpha. A weighted index using the S&P and some appropriate underlying geographical/sector index would likely reveal a truer beta/alpha breakdown.

II. **Information Ratio.** The information ratio is often mistakenly used as a metric to assess the consistency of good returns. **The fundamental problem with the metric, however, is that it punishes good use of variable beta or variable leverage that produces right-tail returns**. In its attempt to quantify consistency of returns, it assumes that a fund is trying to track a benchmark. **Hedge funds, by their very design, should not track anything. In fact a *low* information ratio and low inter-fund correlation characterize good fund-of-fund portfolio construction.**

As illustration consider the two hypothetical USD funds below, with the information ratio of each calculated against 1 month USD LIBOR. The funds have the following annualized returns and volatilities:

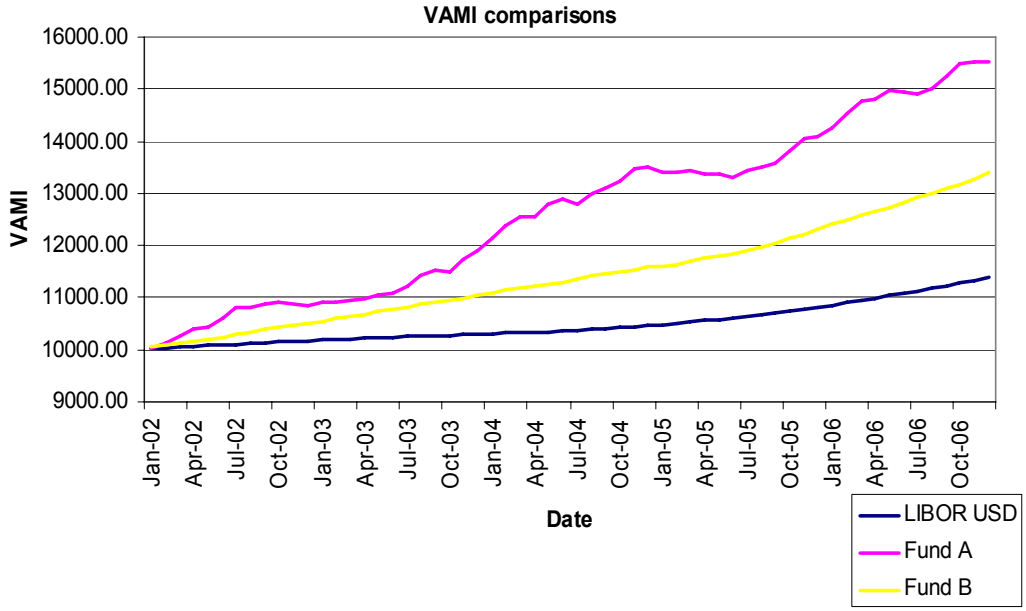
	Annualized RoR	**Annualized Volatility**
Fund A	9.25%	2.88%
Fund B	6.02%	0.65%

Fund A achieves superior returns with relatively few drastic upswings and a fair number of flat or minimally down months. Fund B is quite consistent in its performance, even if somewhat boring in its returns. The information ratio of Fund A is 2.21; the IR of Fund B is 6.70. A ranking of the two funds based on IR would indicate that Fund B is over three times "better" than Fund A. **This example of ranking based on IR is not extreme; it is precisely the process some in the industry are using to select funds.**

I shy away from using the information ratio in the fund selection process for a reason that is worth re-stating: **funds are not designed to track anything.** Why, then, would I rely on a tracking metric to select funds? In this example of Funds A and B I would select Fund A for its consistent and superior returns.

The information ratio is an excellent metric for ETFs, but I give it little consideration in the evaluation of hedge funds or funds of funds. **A high information ratio comes with good tracking of an arbitrary benchmark; if we use LIBOR as the benchmark, as is often done in IR calculations, information ratio is essentially telling me how correlated funds are to interest rates. Since funds are intentionally designed to track nothing, the information ratio is of little use in the hedge fund investment process.**

One problem that has become common in hedge fund ranking is the use of LIBOR as an information ratio benchmark. In this case, the information ratio and the Sharpe ratio are nearly identical. Ranking systems incorporating Sharpe and information ratio in a multi-sort process will essentially double-count Sharpe when LIBOR is used as the information ratio benchmark.



III. Sharpe and Associated Metrics. The Sharpe ratio is a good metric for fund assessment because it measures a fund's excess returns over the standard deviation of returns. High-performing, low-volatility funds have a high Sharpe Ratio. Sharpe looks to be a great metric, but it can lead us astray. Consider our goal of capturing upside beta. The Sharpe ratio doesn't distinguish upside volatility from downside volatility, so it can severely underestimate a manager's ability to capture upside beta while preserving a moderate yield in down markets. The Sortino ratio, which does not penalize upside volatility, is a better metric.

The industry favors use of the Sharpe ratio in individual fund selection, but at the fund of funds level I am not always looking for the top Sharpe- or Sortino-ranked funds. My goal is implementation of the market call at the fund of funds level. Fund A behaves more like a stock because it has high excess returns. Fund B behaves more like a bond as roughly a LIBOR+ fixed-yield instrument. Fund B has a higher information ratio and Sharpe ratio than Fund A. Fund B behaves more like a floating bond and Fund A behaves more like a

stock. In my design of a synthetic market call fund-of-funds I'll choose Fund A in a bull market and Fund B in a bear market. Recall that <u>adaptation</u> to the market environment is what keeps the synthetic market call intact.

Section Three- Beyond Metrics: While the fund metrics outlined in the previous two sections provide a good indication of performance, they give little insight into the advantages of fund-of-funds investing. Fund-of-funds fees should buy some advantage above that which I can get from a single fund. **Though leverage at the FoF level can produce superior expected returns over single funds, the real advantage to FoF investing is reduced volatility through mitigated drawdowns: in short, implementation of the market call. No single metric provides me with enough information to make an investment decision.** I'm building funds with a 6% market call option, which translates into variable beta funds that capture market upside and behave like bonds in down markets (or said another way, minimize drawdowns in down markets). **I follow a preliminary sort based on assessing portable alpha, variable beta, random beta and variable leverage. Then I supplement this quantitative analysis with a qualitative overlay based on the following:**

I. **Attribution. Plain-vanilla metrics do not give me information on sector or geographical risks;** they do not give me an understanding of P&L attribution. Attribution analysis is an extremely important component of fund selection that pure quantitative analysis will overlook. One challenge preventing purely quantitative attribution analysis at the fund-of-funds level is limited transparency. Only with thorough due diligence can we extract attribution information.

   As a brief anecdote on the value of attribution, I mention fund labels that are quite misleading. Beware pure quantitative analysis on **emerging markets funds**. Most top-listed emerging markets funds this year were Russia funds, where only a handful of liquid stocks comprise the entire investable universe. Blind selection based on any quantitative metric for emerging markets would lead to an extremely highly-correlated emerging markets allocation.

   Pan Asia funds also deserve scrutiny. We have found several "Pan-Asian" funds, for example, whose overall returns are quite good but all profits are driven by China while all other geographical attribution is negative.

II. **Mind Your Marks.** Another less obvious flaw with making decisions based on pure performance comes in the form of marking. **Portfolio marking may generate misleading absolute returns data**. **Marking can**

be highly discretionary or it may simply be difficult to mark with accuracy. Good due diligence will expose suspicious marking.

Another consideration that must augment absolute returns evaluation is an effort to understand a fund's liquidity. Private equity, which is becoming an increasingly popular component of hedge funds, serves as an ideal example. A fund using fair-market valuation – or any one of several accepted valuation practices – will show P&L that likely says little about my ability to capitalize on what might appear to be excellent absolute returns.

III. Mind Your Benchmarks. In the previous section I warn about minding marks; now I add a warning about minding benchmarks. A recurring fallacy I see in hedge fund metrics results from improper use of benchmarks. I've already mentioned that the information ratio often uses LIBOR, falsely presuming that a hedge fund *should* track LIBOR. I additionally point out that, LIBOR-based information ratio calculations lead to a metric identical to the Sharpe ratio (or nearly so – depending upon the method of calculation).

Another benchmark-related fallacy that seems to pop up frequently is the use of S&P for information ratio calculations. In addition to the fundamental flaw in assuming a fund should track the S&P, a paradox arises from information ratio calculations based on the S&P. On the one hand people like to see a high information ratio and a low beta (high alpha). **When the S&P is used as the benchmark for calculations, the goal of low beta and high information ratio is impossible because beta and the information ratio are highly correlated when the same benchmark is used for both calculations.**

IV. Consistency of Returns. Before I explain what I mean by seeking consistency in returns, let me be clear on what I *do not* mean. I am not looking for returns, for example, that consistently track a benchmark (e.g. LIBOR). In Section II I explained the fallacy in looking for a fund to track any benchmark. **What I *do* mean to justify here is the need for a manager's consistent application of portable alpha, variable beta and variable leverage. In short, I'm looking for consistent implementation of the market call.**

Good returns only have meaning if we have evidence that the manager can generate such returns with consistency. If absolute returns are good consistently across a sufficiently long time horizon with variable market conditions, we have developed a case that the manager can employ portable alpha, variable beta, and variable leverage with skill. **Consistently high returns are the holy grail of hedge fund managers.** As a simple rule I gravitate toward funds with more than 3 years of track record. Even then, I look beyond pure volatility to the time points at which

drawdowns occurred to determine which part of the synthetic market call the manager failed to implement. A cursory review of the time periods of drawdowns can reveal a lot about a manager's risk level and ability to *adapt* to different market conditions.

Assessment of fund-level inadequacies in implementing the market call is the essence of fund of funds management. With an understanding of where in various funds the market call has decayed, I then work at the fund of funds level to re-constitute the market call.

V. Separating Random and Variable Beta. In previous sections I distinguished intentional use of variable beta from random beta, providing the caveat that the two cannot be distinguished from a rolling beta chart. **It is difficult, but not impossible, to distinguish how effective a manager is at using variable beta vs. how often profit is driven by random beta.** Note that I do not claim that we can fully separate variable and random beta; we can only determine how effective a manager is at using variable leverage to his benefit and avoiding downside (loss-generating) random beta. **At the fund level, with full transparency and an understanding of exactly when a manager intends to apply beta (i.e. when we have full transparency), we can use statistical significance tests to determine how effective a manager is in his use of variable beta and avoidance of loss from random beta. At the fund-of-funds level (without transparency), we use a simpler metric as a proxy.**

The first step in the process requires a number (we'll use the symbol Φ for this number) that combines beta with P&L. We choose a fairly simple metric as follows:

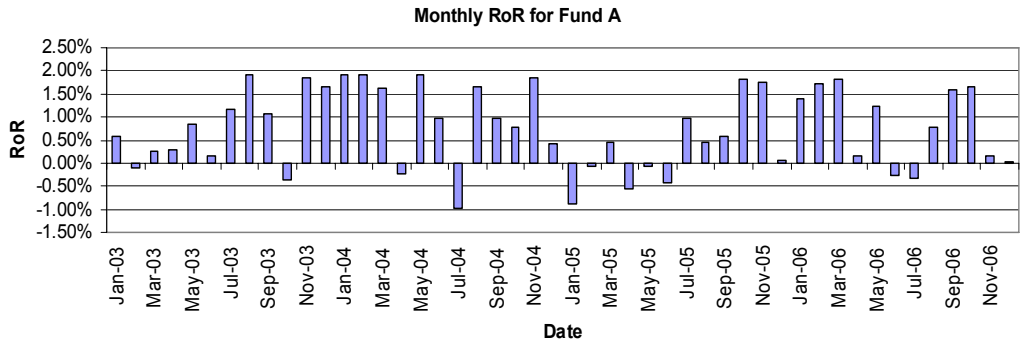
Φ = |β| x RoR, where **|β|** is the absolute value of beta (forces the beta value to be positive). Note that I've used bold lettering to denote each metric as a vector (or time series) rather than a single calculation.

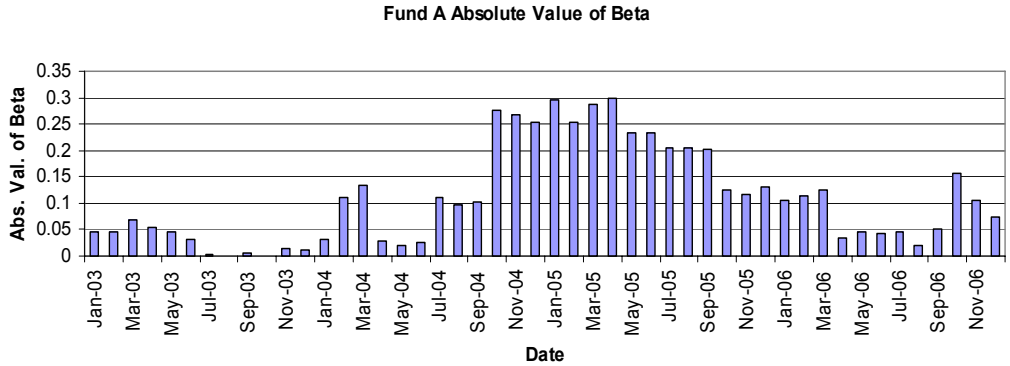
Using a 12-month rolling Φ chart, we get a time series representing **profit-producing beta**. Now comes what appears to be a tricky step, but stay with me just for a few moments; I'll provide a pretty picture that makes this perfectly clear very soon.

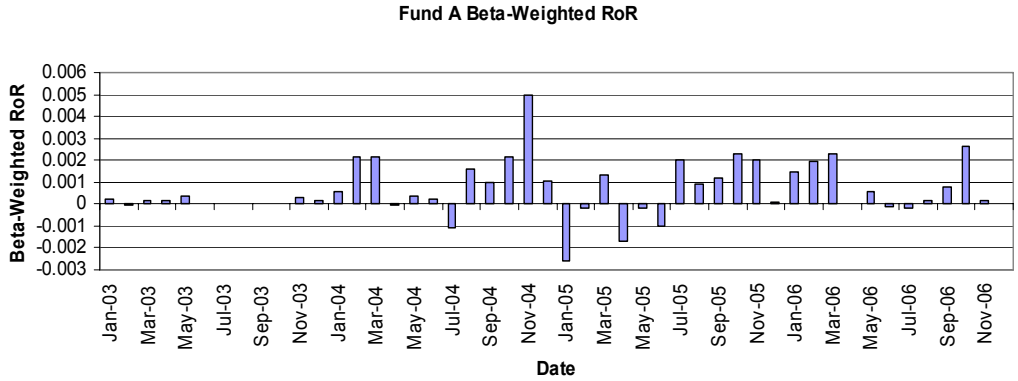
Next summing the positive part of this chart separately from summing the negative part of the chart gives two numbers: the first tells us total beta-weighted profitable RoR driven by beta (we'll call this number $\check{R}_P$), while the second tells us the total beta-weighted loss-associated RoR driven by beta (we'll call it $\check{R}_l$).

We calculate our "beta skill" metric as $\check{R}_P \div (\check{R}_p + |\check{R}_l|)$. A value of 0 indicates the manager has had absolutely no skill (or luck) in applying variable beta or avoiding detrimental random beta. A value of 0.5 indicates

a likely random-beta driven P&L. A value of 1 indicates the manager has had perfect skill in applying variable beta (and potentially some luck with upside random beta). Here's an example of the calculation:







The top chart shows the monthly RoR for the fund; the middle chart shows **|β|**, the rolling 12-month absolute value of beta. The bottom chart shows a 12-month rolling **Φ,** which is the monthly beta-weighted RoR. **Visual inspection of the bottom chart shows many more profitable beta-weighted months than negatives; moreover, the amplitude of the positive months is greater than the negatives. Consequently we expect Φ to be greater than 0.5. Said another way, it appears that this manager can use beta to his benefit and has little downside random beta exposure.**

A quick calculation for this fund reveals that Φ is 0.84, confirming our visual expectations.

Conclusions: With so many metrics running around that are supposed to help us identify manager talent and fund risk, it's important to remind ourselves what we really want in hedge funds. **In this edition I lay out a qualitative and quantitative approach for assessing funds, emphasizing implementation of the market call – stock-like returns in a bull market and floating-bond returns in a down market.**

I've summed up the components of the market call as: portable alpha, variable beta, and variable leverage, also introducing random beta as a concept that can be beneficial or detrimental to returns.

Equally as important as understanding what we want in a fund or fund-of funds is recognizing the industry standards in measuring funds. I see a lot of fads that represent the best intentions of providing a systematic filtering for good funds, but many of these metrics have problems in their fundamental assumptions or ability to capture what we expect they will capture. Of particular note is the fixed-window measurement concept, which I introduced in the last Sopa edition as solvable through wavelets. I'm not arguing against fixed-window measurements; they're completely necessary to get to single metrics that permit comparison among funds. **I am, however, pointing out that fixed-window measurements can produce beta wash or otherwise mis-lead us.**

Finally I introduce a metric that allows us to look at "beneficial beta," a manager's ability to use variable beta to his advantage while mitigating downside random beta.

Good luck in your investing and we hope you enjoyed your piranha soup…
Mari Kooi and Matt Oefinger
Wolf International
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