AQR CAPITAL MANAGEMENT

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Seven Thoughts On Running Big Money For the Long-Term (2009)

Being an institutional investor is tough, now more than ever. And while there is no "silver bullet" to solve the many challenges investors face, we want to share a few thoughts and ideas in the hope of sparking or sustaining a dialogue with investors. Please let us know what you think.

Summary Of The Seven Thoughts

1. Embrace Risk – In the Long Term, You'll Need It
2. To Survive in the Long-Term, Brace Yourself for the Short-Term
3. Diversify Your Market Risk as Much as Possible
4. Seek Out Alpha in the Land of Beta
5. Add as Much Manager Alpha as You Can Find, Net of Fees and Factors
6. Don't Be Afraid to Take a Contrarian View
7. Be Innovative in Combining Market Beta, Hedge Fund Beta and Alpha

This "Seven Thoughts" represents an update to the prior version, which we published in late 2007. Obviously, a lot has changed in the markets since then, but (perhaps not too surprisingly) our thoughts on long-term strategy and policy are little changed. We do try to address some of the worries we have heard from investors in recent months, and have also updated the note to reflect some of our recent thinking about alpha, hedge funds, and what we call hedge fund beta – the unique risk premia associated with specific active management strategies, mainly implemented by hedge funds.

Introduction

No one ever said being an institutional investor was easy. And if they did, they certainly don't say it anymore. Consultants, money managers and even beneficiaries are constantly telling you what you should do. Overseers question your every move. And every so often, you get slammed by the market. Success is "easy": when the markets are doing well, you just have to beat them (and beat your peers), and when markets are down, you must generate positive absolute returns (and beat your peers). And since the size of your portfolio can be hundreds of millions (or even hundreds of billions), the cost of "mistakes" is enormous. And it all rests on your shoulders.

At AQR, we are occasionally asked for our general thoughts on institutional investing.[1] While it is true that (as noted above), there is no shortage of people willing to offer unsolicited advice to institutional investors, we hope to spark or sustain a dialogue with our investors about long-term investment policy issues. In a world where there is enormous pressure on individuals and organizations to hew to the mean, perhaps this will help inspire or encourage those investors bold enough to forge their own approach.

Finally, there is no silver bullet. This is obvious (or will be soon), but it's something to stress up front. And as an investor, you should be skeptical of anyone offering a silver bullet, especially in the current market environment. So, having hopefully lowered your expectations, here are the Seven Thoughts:

1. Embrace Risk - In the Long Term, You'll Need it

Over the long-term, there is a positive risk-premium (though you might not know it after the last 18 months, in reality it has been growing). Assuming rational diversification and risk control, if you take more risk then your long-term expected return is higher. One exception, is that in general, you do not get compensated for any extra risk you take on that nobody must bear (e.g., under diversifying is a risk you don't get paid for). Put yet another way, diversification is the most accessible free lunch to all of us.

Being truly long-term is one potential advantage for long-lived institutions versus other investors, because it allows them to bear more near-term risk than those with shorter horizons. In fact, it's probably the largest advantage for big institutional investors.

Setting up your portfolio to take and withstand substantial volatility without changing course is likely the leading determinant of long-term success in investing. For example, Warren Buffett's track record is more about having a decent Sharpe ratio and sticking with a high volatility process for the long-term, than it is about having a very high Sharpe ratio (he has had some harrowing streaks of disastrous years).

Whether it is by asset allocation choices, pre-commitments (e.g., private equity), organizational design (not having non-investors pull the plug based on short-term results) or just plain personal fortitude, taking and maintaining an aggressive posture will be a huge explainer of long-term returns, as long as it's an aggressive posture you can maintain (and herein lies the art!).[2]

In the last version of the Seven Thoughts back in 2007, we commented that the risk premium is "lower, perhaps substantially, than in the past." Since that time, the equity market has plummeted and the bond market has rallied. Nonetheless, at the time of this writing (the first quarter of 2009), the statement remains true, although the situation is more nuanced. Exhibit 1A shows an updated graph of the same crude, but useful, measure of the expected real return on a simple portfolio used in the last version. For a portfolio that holds 50% U.S. stocks and 50% U.S. bonds, it is simply 50% 10-year earnings-yield on the S&P 500 (10-year real earnings divided by current price) and 50% 10-year bond yield minus three year average trailing inflation.

Today the expected real return is higher than it was a few years ago, but still well below the long-term average. Importantly, the expected real return on equities is above average (Exhibit 1B), while the expected real return on bonds is below average (Exhibit 1C).

[1] Indeed, the attached seven thoughts in this note are based on some questions posed by Britt Harris around the time he joined the Teacher Retirement System of Texas as Chief Investment Officer. I would like to thank Britt for prompting these ideas and inspiring me to put these thoughts to paper. Feel free to blame Britt if you disagree with anything in this document.
[2] See, for example, Hood, "Determinants of Portfolio Performance – 20 Years Later," Financial Analysts Journal, September/October 2005; Ibbotson, Kaplan, "Does Asset Allocation Policy Explain 40, 90, or 100 Percent of Performance?" Financial Analysts Journal, January/February 2000.

Exhibit 1A: A Measure of Expected Future Returns on Stocks and Bonds

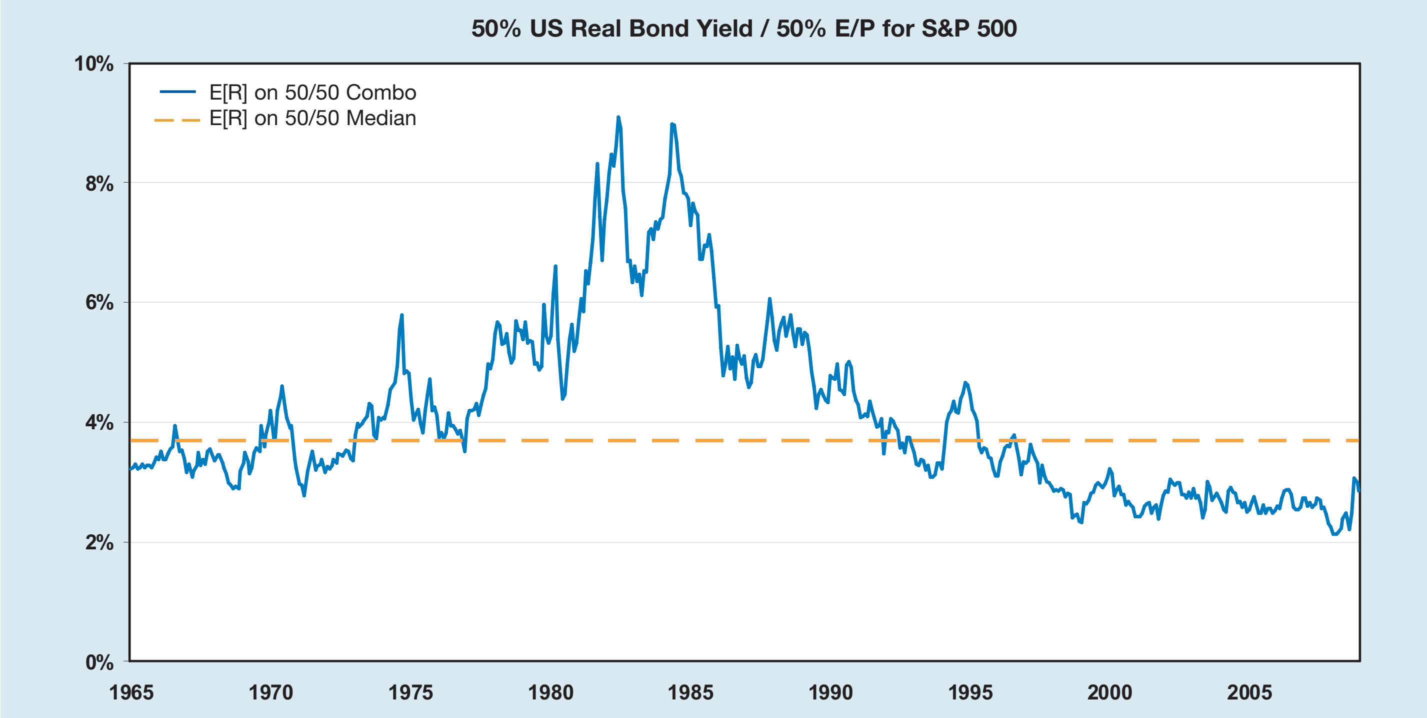


Exhibit 1B: Equities Starting to Look Cheap

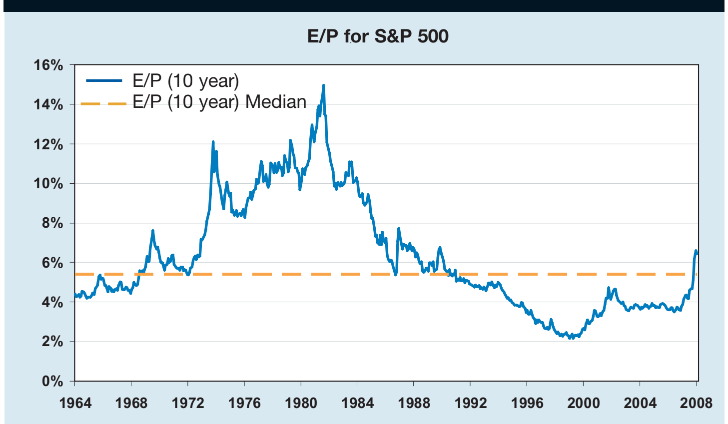
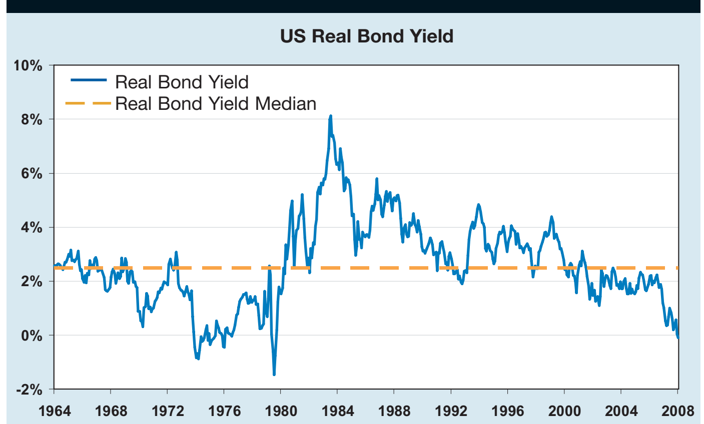


Exhibit 1C: Bonds Still Look Expensive



However, we believe the environment for risk-taking is much more attractive today than it was just 18 months ago. At the same time, Exhibit 1A shows below-average.

But here's an obvious, yet important, point. Expected returns are low versus history, but still decently positive. There is no reason expected returns have to rebound to historically average levels (where this expected real return would go up towards 4% or higher and current prices would fall further). It is possible instead that past returns may have been too high for many reasons (excessive risk aversion after the Great Depression, inability of investors to actually achieve these returns due to transaction costs, taxes, the absence of low cost index funds and other barriers to diversifying). Maybe today isn't bad, but rather the past was too good. (Many academics have spent a good part of their careers on this so called "Equity Premium Puzzle"!) The current prospective returns may be more rational than the past higher ones.

So do we think this is a good environment in which to be taking risk? After all, the S&P 500's decline in 2008 was the worst since the 1930's. But the silver lining is that the shake-out in equity markets (and credit, and commodities, and the occasional money market fund), has led to a marked increase in risk aversion across investors. According to the immutable laws of supply and demand, fewer investors willing to take risk means higher returns for those who are willing and able.

Long-term institutions make most of their money by taking risk. Most of that risk will come from beta. Alpha is great, but even if you are good at finding it, it's hard to find enough. So, we believe any large institution should be significantly long beta. Our recommendation is reinforced by the fact that, in constructing a beta portfolio, we believe one can do a whole lot better than simply 50% U.S. stocks and 50% U.S. bonds. (Indeed, much of the rest of this document will be about how one can do better than this 50/50 portfolio!) And the icing on the cake is that you can reasonably expect to be better-compensated as a beta investor today than at almost any time in the last two decades.

One other good thing about taking risk as an institutional investor is that you have the benefit of a portfolio-wide perspective. Of course you must pay attention to the risks associated with specific asset classes or strategies or managers, but you can consider these in the context of a wider portfolio. A risky asset may be appropriate if you are not allocating significant capital to it. An active strategy may so volatile that the short-term returns are scary, but if a potential 50% loss in the strategy means a loss of less than half of one percent in your portfolio, the strategy may still be appropriate. This pre-supposes that you are able to get your board to focus on the big picture, too. This is not a trivial project (more on this below), but it is one that can lead to vastly improved portfolio design and implementation.

WHAT IS RISK?

Many people (including me!) talk about risk at great length, so it's worth spending a moment on exactly what we mean. As a quant, I usually talk about risk in terms of volatility – or the degree of uncertainty we have about future portfolio returns. This approach is also conveniently powerful in allowing us to model different possibilities and work from a simple set of assumptions about individual asset classes to make reasonable conjectures about how portfolios will behave.

The downside to this approach is that, while some people find it very intuitive, others find it alien. For example, many investors argue – with some reason – that the uncertainty about future returns doesn't matter on the upside, only on the downside. "Surprises" relative to my expectations are only bad if they cost me money. For these investors, risk generally means the risk of losing money; their preferred risk measures will give them some sense of how much they will lose (or could possibly ever lose) in a bad outcome. Of course, the latter can be difficult (or impossible) to quantify – or, perhaps, be the not-very-useful "you could lose 100% in some shockingly worst case scenario that we can barely imagine."

The good news is that our standard volatility measure of risk is usually not unrelated to the "reasonable worst-case scenario," which means that investors can – and should – use both portfolio volatility and some notion of possible future loss in assessing the risk of various investment strategies. The most important thing is not to take either of these measures as written in stone, but to give some thought to what they do and do not encompass. For example, volatility calculations assume a normal world ("normal" in the statistical sense and the common-sense one) – one in which a hundred-year-flood occurs every hundred years or so. But we know from experience that finance is not a "normal" world and that we seem to get a hundred-year-flood every decade or two. So planning accordingly is key. Likewise, a "worst-case" scenario based on how some investment (or group of investments) has performed over the last eighty years of recorded data may give us some intuition of what a worst-case scenario could be going forward, but is far from the definitive word on what the future might hold (it could be wildly pessimistic based on some never-to-be-repeated disasters, or optimistic based on some yet-to-be-seen disasters). More on this idea below.

2. To Survive in the Long-Term, Brace Yourself for the Short-Term

Institutional investors must take risk, which involves short-term fluctuations. And the more risk they can tolerate and endure without breaking, the better the long-term expected return. So, how do you maximize the amount of risk you are comfortable with? Well, there's no magic here, but consider a few small suggestions.

The first, obvious step is making sure the investment professionals at the top really believe that their responsibility is to prudently embrace risk. This includes not just the investment staff, but the board. It is crucial to have top-level support, since if the investment team reports to non-investment people who don't buy into this, the whole project will fail at precisely the wrong time. If the investment team doesn't report to non-investment people (and perhaps even if they do), the key is to work on this through a combination of education and scenario analysis.

Work through scenarios with yourself and your board (or to whomever you report) of 2-, 3-, and 4- standard deviation events for your overall portfolio over months, quarters, and 1-3 year periods; drill in that these <u>will</u> happen and it's just a question of when (and we were saying precisely this before 2008!). And indeed, the four-standard deviation events that in a normal world are supposed to occur once every hundred years may well occur every decade. If you're taking a contrarian approach, then go over similar scenarios to understand the possible spread in your returns relative to your peers (i.e., understand that if we implement our complete strategy, we will see 1-3 years where we lose by x, y, z to our peers).

Similarly, have disaster plans for truly scary market melt-downs. An example: if market A falls to X we plan on buying more, not selling in a panic. At the same time, don't go with plans you may not be able to stick to (we are seeing some of this in the endowment world where assets have fallen to where many wish to buy, but feel constrained by their already significant losses and larger-than-they-perhaps-thought private equity commitments). Another way to approach this is to outsource some of your plans for melt-downs by investing in funds that aim to profit by making strategic investments in times of relative panic. These could include funds that invest in distressed assets and funds that provide liquidity when specific assets, markets or active management strategies fall rapidly out of favor.

In general, you have to protect yourself from disaster. The way to do this is *not* by buying insurance, as that is almost always a sucker's game long-term. The long-term players who can withstand short-term pain should be *sellers*, not buyers of insurance (except in extremely rare tactical situations where perhaps you think insurance is exceptionally cheap to buy). Instead, stress-test your portfolio in advance. Here are a few ways to stress-test individual managers (in addition those outlined above which focused on markets):

- Imagine that you realize negative 3- or 4- standard deviation active returns from individual managers and make sure that does not kill you (where "kill you" means you are forced to permanently change the way you run the portfolio)
- Imagine that you realize a -100% from very levered investments[3] and make sure that does not kill you. (Note, we run some of these strategies, and don't think -100% is a serious possibility, but if I was making outside investments in *anyone* who was very levered I would always make sure a - 100% result was not Armageddon for my overall portfolio)

Statistically shocking events ("Black Swans" if you will) definitely occur. At the beta level we all have to collectively bear them, and insuring against them tends to be overly expensive if done on average. So again unless you can correctly time when to buy such insurance you benefit by avoiding these costs. They are the price of poker.[4] At the individual manager/portfolio level I'm again nihilistic you can avoid them entirely, but what you can make sure is that if it happens somewhere it does not kill you!

In running a portfolio for the long-term, assets that pre-commit you (anything with a lock-up) or even shield risk from visibility (anything that doesn't get marked to market) can be helpful – but fool yourself with open eyes! (an oxymoron to build on.) Note that in an earlier version of this document, we explained private equity as perhaps a possible vehicle for sticking to your plans in a storm. However, the events of the last few years have led to a more nuanced view. More on this below.

[3] Of course, "very levered" is a vague term (and prompts the question "relative to what?"). The last few years have reminded us that even strategies that don't seem "very" levered may turn out to be too levered for their own good if the world gets caught up in a wave of de-risking. So while I wouldn't subject every strategy to a -100% stress test, I would look out for strategies that depend on financing – particularly strategies that by their nature use short-term financing for illiquid investments (i.e. strategies that "borrow short and lend long") – and closely monitor my aggregate exposure. This does not mean avoid, some of these are very lucrative strategies even including some probability of disaster, it just advocates the low probability of disaster should not kill you if it comes up.

[4] I wrote these words, perhaps a bit cavalierly, well before the market collapse of 2007-2008. It's clear that in 2008, the "price of poker" – the cost of taking risk – was enormously high. But that does not change the central thesis that investors need to take risk – over the long term and with a long-term horizon – to achieve their desired return level.

Having a long-horizon should lead to higher returns if it allows you to take more risk, but this long-term perspective can also be more directly monetized by trading liquidity needs for return. We believe there is a liquidity premium in the world, and although it varies through time, when it is wide (like today), less liquid assets (e.g., private equity, real estate, venture) might have an average advantage, although much of this may be eaten by fees.[5] Another way to monetize this pre-commitment is to negotiate with managers (hedge fund or otherwise) who might value a longer lock-up to the point of giving fee breaks. This seems to be a clear win-win. If you are reasonably certain you'd stick with a manager for 3 years anyway, take the free money.

In the long run, picking managers should be a smaller part of the job than working with whoever can pull the plug on an investment program so they understand the possible outcomes over various time horizons. The goal is to ensure you will be able to stick with a program through the tough times. If this is done successfully and the world does not collapse to the point where asset allocation involves canned goods, it's hard to imagine not creating a successful long-term result.

3. Diversify Your Market Risk as Much as Possible

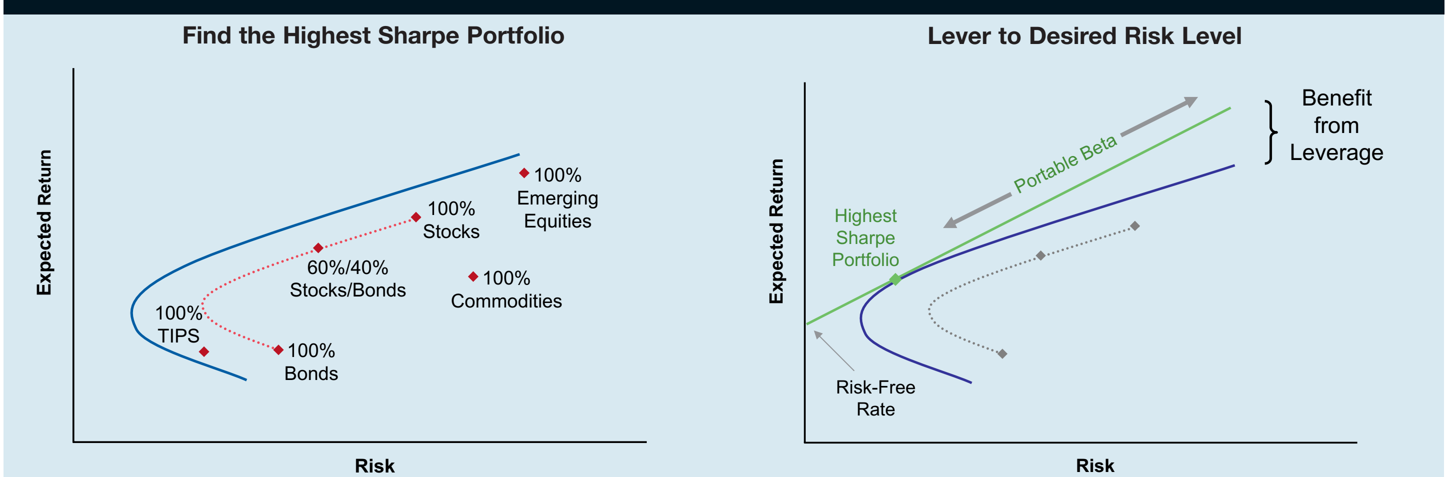
Market risk – beta – will drive the lion's share of long-term returns. However, we are not fans of the old-school combo of stocks and bonds used as Exhibit 1A. In a nut-shell, that combination has far too much equity versus bond risk. More important, such a portfolio is way too under diversified. Unfortunately many investors under-diversify as they focus on capital allocations – rather than risk allocation. Shifting to a risk budgeting framework can improve results by more clearly highlighting the true degree of concentration in certain types of risk – primarily equity risk. Risk budgeting is a relatively straightforward process. As an investor, all you need to translate your asset allocation into a risk budget is an expected volatility for each of your current investments and an estimate of long-term correlations between assets. While this can fairly be criticized as far from an objective process with one clear answer, the "big picture" findings, like equities are more volatile than government bonds, are going to drive most of the big changes below, so getting this right to the third decimal point is not important.

This approach means you project the future volatility (or a softer more intuitive notion of risk if you prefer) of your portfolio and then look at how much of that volatility is coming from each asset class. If these risk allocations seem out of whack (technical term), it's again a straightforward process to figure out what asset allocations will drive a better-balanced risk budget. (Risk budgeting can sound controversially geeky, but you can impose a lot of common sense on such a system and reduce or eliminate any "black box" feel). We are big believers in risk budgeting and are always happy to help our clients implement this important diagnostic tool as part of their portfolio management process.

Note again that this focuses on the asset not the liability side, but liability-sensitive investors (such as pension funds) can create a risk budget that incorporates liability risk and examines the critical issue of tracking error between assets and liabilities.

Not surprisingly I am a huge advocate of the academic notion summarized in Exhibit 2.

Exhibit 2: Building a Diversified Market Portfolio



[5] The liquidity premium can also be wiped out by too many people crowding into illiquid investments when the liquidity premium is low. (Think of all the private equity capital raised in 2005-2007). In that case it's temporarily certainly not a premium!! But, have patience, it will be again...

In Exhibit 2 on the left, we illustrate the benefits of diversification. The red line shows the efficient frontier for a simple stock-bond portfolio. That is, for every degree of portfolio risk, we show the combination of stocks and bonds that delivers the highest expected return for that risk. The endpoints of the line represent a portfolio that is 100% bonds or 100% stocks.

When we include a more diversified mix of assets than just stocks and bonds (the blue line), the curve shifts upward. Now, for any level of desired risk, we can achieve a higher expected return thanks to more efficient portfolio construction. This concept is not new to most investors – but that doesn't mean that they all run portfolios that are as diversified as they could be.

On the right, we show a second investment principle. All points on the efficient frontier are not created equal. Each point has its own risk-return trade-off, but some points offer more expected return relative to the risk they take. We think investors should try to find the best return/risk portfolio, which is shown as the green diamond in Exhibit 2.

The bad news is that the "best" portfolio will have its own risk level, which may not be the amount of risk you want (or need). The good news is that if you are more risk tolerant you can lever the best portfolio and if you are more risk averse you can de-lever it (by adding cash). The portfolios created from this approach – shown in the green line – are *better* than those on the efficient frontier.

This principle is from about day two of Finance 101, but is still surprisingly under-utilized, particularly on the side of increasing risk by levering. Of course there are practical limits, and I would never suggest combining significant leverage with significant illiquidity – whether through illiquid assets or liquid assets where you own too much of the market share.

MAKING SENSE OF LEVERAGE

Leverage is always a sensitive issue for institutional investors. On the one hand, leverage is built into many of the assets institutions hold: equities (corporate debt), real estate (mortgages), private equity (bank debt and often high-yield bond issuance). On the other hand, the idea of using leverage at the portfolio level is viewed with enormous skepticism, and leverage in alternative strategies – whether in hedge funds or portable alpha programs – often raises red flags.

We believe investors must be mindful of the risks associated with leverage, but should not treat these risks as being fundamentally different from the risks associated with holding certain volatile assets or from concentrating the portfolio in certain strategies.

The fact is, the use of leverage must be viewed in the context of how much leverage is being used; how volatile and liquid the investments being levered are; and how much a cushion is in place. Properly applied, leverage simultaneously magnifies the risk (and potential return) of the underlying investment and limits the amount of capital at risk in the event of a "blow-up".[6]

One real danger with levered strategies is that investors fail to anticipate the full range of possible outcomes. For example, investors may assume the future returns to a strategy will be normally distributed without many outliers; in this case, a left-tail event or "black swan" could wreak havoc on the portfolio. By definition, our ability to forecast or predict the magnitude of these events is extremely limited. Given this, we think investors must 1) carefully consider each levered strategy independently to understand what types of scenarios will be catastrophic; 2) assess the cumulative value of levered strategies in the portfolio and ensure that this is within their comfort zone; and 3) develop a plan to handle levered investments that get into trouble (or just seem headed in that direction), including a clear process for deciding when to contribute additional capital or cut losses, with a decision framework that is chosen at the time the investment is made rather than once the bombs are falling.

A similar set of issues comes into play with respect to hedge funds. By their nature many "hedged" strategies offer only a modest amount of risk and a comparably modest amount of return. Applying leverage to these strategies lets managers structure them to offer an attractive level of return. The danger, for hedge funds especially, is that a "deleveraging event" can drive people to unwind these strategies. (We consider a deleveraging event to be an external shock that forces one group of investors to sell a group of assets they had purchased with borrowed money). This danger does not mean that institutions should not pursue these strategies; rather, they should take advantage of their large scale and long time-horizon to ensure that when these events occur, they take advantage by providing capital and liquidity. (See the discussion below on contrarian investing). We remain optimistic about the future of hedged, levered strategies and believe that the current risk- and leverage-averse world may represent an attractive environment for this approach. And over the long term, long-short hedged strategies (meaning those that are truly balanced long and short, not a lot of long with some shorts thrown in) should be incredibly valuable in the context of an overall portfolio because they are largely uncorrelated with all the other exposures in that portfolio.

[6] This assumes the leverage is taken in a separate vehicle with limited or no recourse to the overall portfolio. And while the use of leverage may limit the amount of capital lost in a blow-up, it may also increase the likelihood that a blow-up will occur.

At AQR, we've developed a strategy we call Global Risk Premium or "GRP" (a handful of other firms have similar strategies, though they all differ somewhat). This strategy was our answer to the question "what else besides our pure alpha products should the AQR partners invest in?" These pure alpha products are constrained to have no passive beta. In contrast, GRP is constrained to capture only passive betas. We aim for approximately equal risk contributions from equities, nominal bonds, real assets, and credit assets (corporate credit, mortgage credit, emerging vs. developed FX, etc.).[7] Essentially, we follow a risk budgeting approach rather than the traditional capital budgeting approach. This process has the effect of elevating the lower volatility assets like fixed income to be more equal partners with equities, which we think helps create a higher Sharpe ratio unlevered portfolio. We also diversify each of the categories as broadly as possible (e.g., international, small cap and emerging equities, international and emerging bonds, etc).

We then apply leverage to the whole, and sell it at a beta, not at an alpha, fee (e.g., 20 bps fixed fee for 500 bps of expected volatility, linear scaling if an investor wants more/less volatility). While obviously we are using the AQR example, structuring an institutional portfolio in this direction, or looking for funds that take this approach <u>at reasonable fees</u>, is an important way to create some advantage over the ensuing long-term. One of our critiques of hedge funds is you can explain a lot of their returns with historical returns to GRP, but they charge <u>way</u> <u>way</u> more.[8]

As noted above, an important component of this investment approach is to be truly global. This is a longer discussion, but we are believers that the arguments against global diversification are overstated and the benefits are under-appreciated. Exhibit 3 offers just one example of the way global equity diversification has worked to protect portfolios if you take a long-horizon view. (It's often critiqued for its short-horizon failures, but the long-term should matter much more!):

As a starting point, we would recommend a portfolio that is savagely global, with as much of a global diversification (and as little home-bias) as you can take. A potential reason many shy away from this is the "regret" they will feel when their home country wins over the short-term (and their peers outperform). That regret is real, and so are its potential consequences (e.g., if you report to someone who suffers from similar regret!), but again this is where an investment staff can make a difference by doing as much pre-education as possible (e.g., by showing the impact through good, bad and mediocre times and over different horizons). Basically, none of us are immune, but you earn a better risk-adjusted return over time for acting rationally in the face of possible "regret," not for giving in to it.

You will see below that I call the funds that pursue GRP-like structures a form of "portable beta." It's an imprecise play on words and obviously an analogy to portable alpha. The idea is betas are portable because you aren't just choosing market-cap

Exhibit 3: How Did the Global Portfolio Do When You Needed it Over the Long-Term?

Rolling Real Returns from Each Investor's Perspective Since 1950

	5-Year Periods		10-Years Periods	
Home Country	**Worst Home Country Returns**	**Global Returns in the Same Period**	**Worst Home Country Returns**	**Global Returns in the Same Period**
Japan	-47.4%	-9.7%	-53.8%	152.0%
Germany	-53.1	-36.1	-44.6	-5.1
U.K.	-67.1	-32.9	-61.3	-6.9
France	-52.9	-37.4	-57.9	-21.2
U.S.	-44.8	-20.9	-39.9	-11.3
Average	-53.1	-27.4	-51.5	21.5
Global-Home Average	**25.6%**		**73.0%**	

Source: AQR.

[7] It is not enough to say that traditional portfolios are dominated by high-volatility assets so you should be more equally risk-weighted. You also need an argument why this traditional allocation to high-volatility assets is too much. Based on our analysis, over long term (not necessarily that long given the dearth of data on some asset classes, let's say several decades), each of these four categories of risk has had a comparable risk-adjusted return. We think that fact, coupled with the given uncertainty about how these different risks will perform over the next several decades, makes equal risk a reasonable allocation. Another argument, besides just strong empirics, is that investors are willing to follow theory by adding cash to the tangency portfolio to reduce risk, but less or unwilling to lever, so on net when they want to add risk they try to sell low-volatility and add high-volatility assets, and thus high-volatility assets are at least somewhat generally overpriced and vice versa (I say try as on net all assets must be held). Note, this does not prove equal risk weight is the answer (nobody knows the answer). Equal weight may in fact go too far. Part of the reason for our product design is admittedly that equal weight is clear and simple, and more importantly, even if it goes too far viewed alone, an allocation to equal risk weight moves investors' portfolios, generally dominated by equity risk, even faster towards what we think is a more optimal solution. If people gave us all their money we'd have to think about this harder but that does not seem likely soon!

[8] Note that was the rarely used, illegal in seven states, underlined double "way".

weights, you are consciously choosing what you believe to be the best long-term risk-adjusted return and levering to (or de-levering to) your risk target. However, two caveats are in order. First, in the case of very large investors, there may have to be some compromise as liquidity issues may prevent investing solely in the optimal beta mix. Second, obviously I am assuming some type of allocation "alpha" in the way we're allocating betas (assuming people are averse to leverage and thus when risk-tolerant, over-sell low risk assets to purchase high risk assets). In other words, I'm recommending a non-equilibrium portfolio of betas (not everybody can own it, we all must add to cap-weighting). Thus, we will have to come up with some way of deciding when this ride we are recommending is (if ever) over.

This general principle of combining a highly diversified portfolio with enough leverage (or cash) to attain your risk goals is likely the best way to structure your beta portfolio, and this is where you'll get most of your return. If this is too radical, you can still move as much in this direction as possible.

JUDGING DIVERSIFICATION

There's an important caveat at the intersection of the last two points. On the one hand, we argued that investors should diversify risk as broadly as possible to achieve the portfolio with the highest risk-adjusted return. On the other hand, communication about goals and reasonably worst-case scenarios is also crucial. The last 18 months have tested investors' ability to do both of those things at the same time.

Investors came into 2008 expecting that the diversified portfolios they had built over the last year would help them weather the storm, only to be vastly disappointed by their actual results. Many asset classes thought to be diversifying – credit instruments and emerging markets to some extent, commodities to a large extent – failed to achieve the desired goal. How should investors deal with this kind of situation?

Real Returns from Each Investor's Perspective Since 1950

	3-Month Periods		12-Month Periods	
Home Country	Worst Home Country Returns	Global Returns in the Same Period	Worst Home Country Returns	Global Returns in the Same Period
Japan	-34.3%	-41.7%	-47.2%	-51.8%
Germany	-36.6	-22.4	-54.4	-42.6
U.K.	-30.5	-31.5	-60.8	-36.6
France	-31.1	-28.9	-53.0	-41.8
U.S.	-30.1	-23.0	-47.5	-45.4
Average	**-32.5**	**-29.5**	**-52.6**	**-43.6**

Source: AQR.

One key is defining an appropriate time horizon for assessing diversification strategies. Too often, investment boards did not fully grasp the possibilities – and limits – of diversification. Diversification was sold as a hedging strategy, a way to avoid losing money when equity markets go down. But diversification can't eliminate risk (including the risk of loss). What it can do is protect against ugly portfolio outcomes, particularly over the medium and long term. Compare the exhibit above to the earlier chart about international equity diversification.

On a one-month or three-month basis, global equity diversification doesn't seem to help very much. When your home market suffers for a month (or three), the rest of the world seems to suffer too. But as we saw earlier, over longer periods of time global diversification leads to meaningfully better results in periods when the home market portfolio tanks.

The same principle holds for other diversification strategies as well. In a crisis, correlations can rise towards 1.0 and diversification doesn't seem to get you anything. But in the medium - to long-term it can be a life-saver. And if it lets you take portfolio risk in a smarter way, it should lead to a better long-term result. But all of this only works if the benefits and limits of diversification are well-explained to whoever can pull the plug.

As it happens, diversification did pay off for AQR's Global Risk Premium Fund in 2008. This is because amid most correlations going towards 1.0, the correlation between government bonds and everything else went towards -1.0. In our portfolio, interest rate risk is an "equal partner" with equity, credit and inflation risk – which means that *on a relative basis* our fund takes more interest risk than most conventional portfolios. This offered an important cushion in a world of market collapse. Although our strategy was down, it did not suffer nearly as much as the stock market or even as much as a less-well-diversified 60/40 stock/bond portfolio. So in this case, diversification did work in the short-term – but we really expect it to earn its stripes over longer periods.

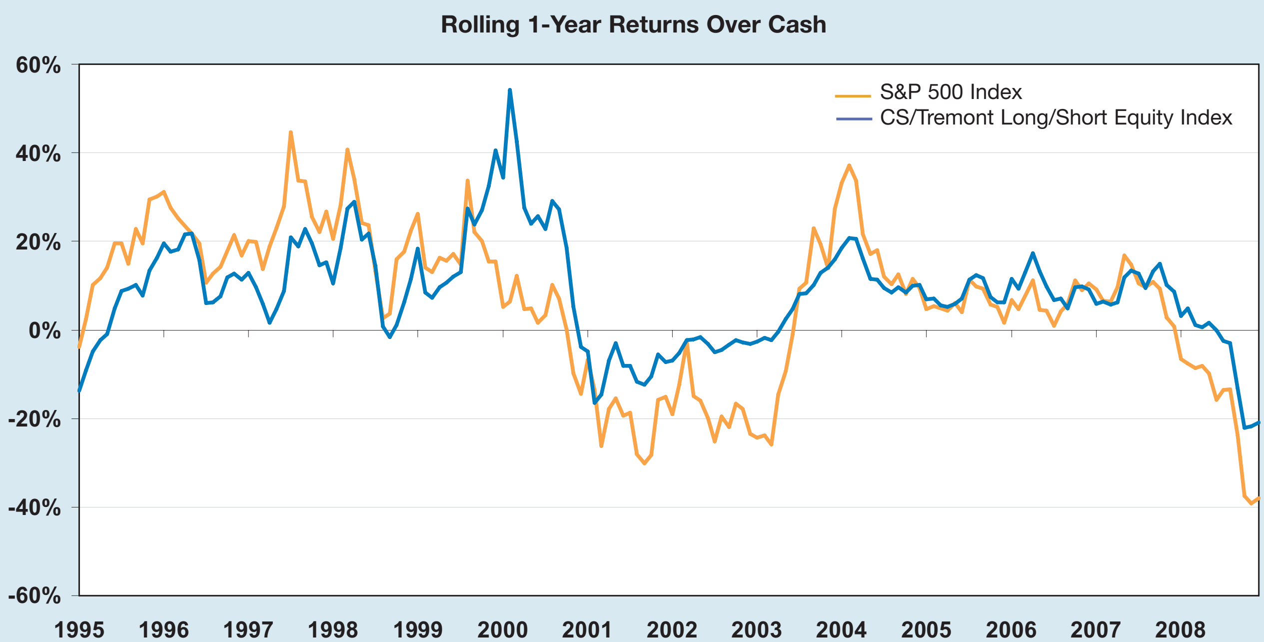
4. Seek Out Alpha in the Land of Beta

In a portfolio context, alpha is incredibly powerful. It's also widely misunderstood. We think of alpha as sources of long-term positive return with low correlation to other available returns, like those from the stock and bond markets. But many people think of alpha as the return from active portfolio management. This is wrong on two dimensions. First, not everything active managers do is alpha (often it's market risk or other betas in disguise). Second, there are sources of alpha that have nothing to do with active management.

The second point certainly needs more clarification. In a portfolio context, most investors correctly view the returns from active management as valuable because they represent a source of returns that is uncorrelated with virtually every other return source they have. But if you flip this idea around, any return source that is not already in your portfolio is a source of alpha to you, whether or not it comes from active management.[9] So if (hypothetically) you don't have any commodities in your portfolio, and commodities are (hypothetically) uncorrelated to each of the investments you do hold, there is no difference between adding commodities to your portfolio and adding an active management strategy that has the same expected risk and return as commodities. All this first point means is that before you go looking for active management, you should make sure you have diversified your portfolio as much as possible (see #3 above). If you're not maximally diversified, adding those last few diversifying asset classes can have the same effect of adding active management, except that it's likely to be a lot cheaper and will probably come with less blow-up risk.

When you do turn to finding active management strategies that can add alpha to your portfolio, first make sure they are really delivering alpha. I am a public cynic about how much alpha is really out there. Exhibit 4 is a graph I love showing. It plots the rolling annual return over cash to long-short equity hedge funds, and the S&P 500.

Exhibit 4: Are Hedge Funds Hedging – or Long the Stock Market?



One does not need a regression-based analysis to see the above lines move together. Basically, I think a lot of "active" managers (in particular hedge funds) are about expensive stock market exposure – not alpha.

Even active strategies that are not just giving you market returns are not necessarily pure alpha. At AQR, we have long argued for the existence of "hedge fund betas," essentially common risk factors shared by hedge fund managers (or other active investors) pursuing similar strategies. The fact that these strategies can be captured by a common risk factor means that by definition, they are beta rather than alpha.

These hedge fund betas are significantly more complex than the betas associated with stocks or bonds. Consider merger arbitrage. Individual merger arbitrage managers invest in a

[9] Cochrane, John, 2007. "Efficient Markets Today." Conference on Chicago Economics, Chicago, Illinois. 10 November.

subset of the merger deals announced at any point in time. But as our colleagues Mark Mitchell and Todd Pulvino have demonstrated[10], virtually all of these managers underperform (net of fees) an index-like strategy that includes some exposure to every announced deal. This "passive" approach to merger arbitrage can be thought of as a common risk factor (the risk of deal failure) shared by merger arbitrage managers – which makes it a hedge fund beta rather than an alpha.[11]

If you're constructing a portfolio and want to add active management, and you don't yet have hedge fund beta exposure, then it is just as valuable as hedge fund alpha – the only question is the fees. We think hedge fund betas (like the beta associated with merger arbitrage) should be available to investors at lower cost than hedge fund alphas.

At AQR, we have put this principle into practice, offering a merger arbitrage hedge fund beta strategy since 2001, a convertible arbitrage strategy since 2003 and more recently launching the AQR DELTA Fund, a broadly-diversified portfolio of hedge fund beta strategies that seeks to encompass the full breadth of liquid hedge fund strategies. We don't "replicate" these strategies statistically, but rather build them from the ground up. For instance, we don't "replicate" the long equity market exposure, even though it's strongly present in the hedge fund indices. Instead, like hedge fund managers, we take a position-level approach to implementing each individual strategy – and as a result, holds hundreds of long and short positions, including stocks, bonds, commodities and currencies.

Because this approach explicitly focuses on hedge fund betas (and views these strategies as risk premia rather than idiosyncratic alpha strategies), our portfolio construction is very different from that of many hedge fund portfolios and funds of funds. First, our strategic asset allocation tries to maximize diversification across these risk premia. Rather than allocate across hedge fund strategies according to the amount of capital invested in the strategy or the number of managers in the space, we simply try to give each strategy a roughly equal share of the fund's risk budget.

In addition, we are disciplined about rebalancing to maintain these allocations. Investors who view hedge funds as alpha often have difficulty rebalancing; if you think your returns are coming purely from manager skill, it's hard to justify reducing your exposure to a skilled manager in order to invest more with one who may be less-skilled. On the other hand, if you view these strategies as risk-premia, rebalancing is a natural strategy to boost your expected risk-adjusted return over the long-term. (In addition, rebalancing a portfolio of liquid hedge fund beta strategies is easier and cheaper than trying to rebalance a portfolio of individual hedge fund investments, even before the new world of "gates" and "redemption restrictions" that have become prevalent).

Finally, we recognize that hedge fund betas – like other risk premia – can become more or less attractive over time, driven by market opportunities and capital flows. At the margin, we think we can improve our performance by making reasonably small tactical adjustments to the weights of the underlying strategies.

Ultimately, we think our approach delivers a positive expected return with low correlation to traditional assets – exactly what hedge funds are supposed to do! Moreover, it does it with better transparency, greater liquidity and at a fair fee. (We think these hedge fund betas, while incredibly valuable to a portfolio, should not command the same fee as truly idiosyncratic and unique alpha strategies). We think the AQR DELTA fund can serve as the foundation of a core-satellite hedge fund portfolio (with alpha managers as the satellites) or as an attractive complement to (or in some cases substitute for) funds of funds.[12]

More broadly, we think all investors should look at the risk exposures in their portfolio and see where they can add new sources of risk for which they will be compensated. Even if these are a kind of "beta," in a portfolio context they look like (and behave like) alpha. In managing portfolios, I think most people spend too much time worrying about alpha and not enough time worrying about beta. Investors spend an inordinate amount of time making decisions about hiring and firing active managers and far less time on the basic questions of how much risk they are taking and what markets they are exposed to.[13] The fact that investors can add what looks and behaves like alpha simply by broadening the universe of asset classes they hold or gaining exposure to the common risk factors associated with active management means that these risk premia – which are often under-represented in most portfolios – deserve more time and attention.

5. Add as Much Manager Alpha as You Can Find, Net of Fees and Factors

This isn't to say that there is no role for active manager alpha in a portfolio. Indeed, once diversified across markets, investors should seek to add as much alpha as they can find. But make sure to pay a fair price. Fees and terms are obviously first order and deserve significant attention. Pay very little for beta, but expect to pay significantly more for true alpha. Also make sure

[10] Mitchell, Mark, and Todd Pulvino, 2001. "Characteristics of Risk and Return in Risk Arbitrage." Journal of Finance 56.

[11] Many stock investors do not want to bear the risk of deal failure. After a merger is announced, the stock price of the target often shoots up dramatically, and the stock's price tends to fluctuate based less on the fundamentals of the company and more on the likelihood of the deal closing. In this environment, many long-only investors naturally seek liquidity – the ability to sell their shares at a new-found profit.

[12] In any case, the hedge fund beta strategies in DELTA should offer a better (= more challenging) benchmark for managers who claim to deliver alpha in these strategies.

[13] This seems like a particularly poor allocation of time given that for even more aggressive investors, active manager risk rarely constitutes more than 5% of the total portfolio risk budget.

to avoid beta masquerading as alpha; paying a 20% performance on equity exposure is not an efficient way of spending your active management fees.

Essentially, we believe large investors will never find so much true alpha (net of factor risk and fees) that they wouldn't want a large allocation wherever they actually find it. In other words, stay flexible – as opposed to saying beforehand we want X dollars with active managers. If you choose an X that is large, you will devote too much time searching for alpha and probably end up with at least some mediocre managers. But if you choose an X that is too small, you will turn down attractive alpha opportunities that could enhance your portfolio's efficiency because you don't have "room." Basically, take alpha wherever you find it rather than targeting a certain amount. Of course, do not allow one source to dominate the portfolio risk (an unlikely event, especially if you view alpha net of market and risk exposures).

The recommendation to take alpha wherever you can find it (and probably in whatever quantity you can get) must be viewed after fees and factor exposures. (And as noted above, factor exposures are fine as long as they are alpha *to you* and are available at a more reasonable fee.) This will rule out a lot of strategies you may consider – but it should leave room for a lot of diversifying beta strategies, a healthy allocation to hedge fund betas, and space for whatever true alpha you can identify.

Another stealth source of alpha, similar to diversifying your betas is reducing manager investment constraints. This is all the rage now (or recently was), and I hate being trendy, but it's pretty much a tautology that *if you think you've found a manager with alpha*, then giving them a mandate with fewer constraints should be better. We advocate below combining unconstrained alpha along with the general approach to "portable" beta described above.

Finding alpha that is truly unrelated to either market exposures or common strategies such as merger arbitrage is great for your portfolio, but it does raise a unique challenge I call the "paradox of factor-less alpha." OK, so it's not a phrase that's going to sweep the nation. Imagine you find a manager who can generate true alpha with no exposures to any factors, and no correlations to anything. Their returns look just like a positive mean plus white noise. That's incredibly valuable (in fact, it's the valuable part of any alpha source, so this really isn't different from the general quest for alpha). However, unless they also have a Sharpe ratio of 3, even these managers will have stretches of underperformance, some which may be quite long. Sticking with factor-less alpha is actually quite difficult as there is literally no explanation for bad performance when it's not working other than "what we believe in and think works over the long-term has had a bad draw lately." Note, I don't mean it's a black-box. It's likely that you can do extensive performance attribution about which positions are winning and losing. But you don't know "why" this performance is occurring, because you don't have factors! Very unsatisfying![14] But if the manager's returns are true alpha, then part of the package means the returns can't easily be explained with market moves and factors.

The "paradox" in my phrase comes from the fact that sometimes it's easier to stick with someone losing from the same reason everyone else is losing.[15] With factor-less alpha, you tend to lose at times others are okay or doing well, and because it's factor-less, you can't give a good explanation (though this pales in comparison to the pain of losing as a contrarian to be discussed below!). But the very fact that this return source is uncorrelated obviously makes it a far more valuable asset. By contrast, someone losing for the same reasons as all others has an easy explanation, but might be adding little portfolio value. So, be very cynical about the existence of alpha to begin with, but once you think you find it, stick with it!

6. Don't Be Afraid to Take a Contrarian View

Very large investors face a particular challenge in adding alpha because they need a lot of it to "move the needle" on their total portfolio return. This means that their search for alpha really needs to focus on "large" sources and away from "small" capacity-constrained sources. In terms of "large" sources of alpha at the asset class / manager allocation level, we think (not surprisingly, given the way we build our own portfolios!) that it's mainly by being, call it, 3-5 year contrarians. We believe that the two basic "anomalies" in finance are value and momentum. Momentum at the 6-12 month horizon is not really feasible to implement at the top level of the portfolio. On the other hand, looking for asset classes / managers where you believe the essential story, but they have been beaten up (on an absolute or relative basis) over a 3-5 year horizon, and acting on that, is a real potential source of scalable alpha at the portfolio level. Another example would be hedge funds. Finding hedge funds that focus on GTAA (global tactical asset allocation) or other "macro" sources of alpha and have a lot of capacity will be more relevant than more micro security-selection or arbitrage-oriented funds. (That feels pretty self-serving, but we do run both types of funds at AQR so we are only complimenting one!)

Acting as a contrarian at 3-5 year horizons is quite hard, both at the asset class and manager level. If you believe that the risk premium to be earned in different asset classes will vary over time, then it makes sense to adjust your exposure to these asset

[14] More than unsatisfying, factor-less alpha can be a red flag for returns that are being manipulated (or fabricated out of whole cloth), as was the case with Bernard Madoff's famously factor-less returns. The lesson here is that if you are considering a factor-less alpha source, make sure you understand the strategy and can verify that the realized returns are consistent with the investment "story."

[15] At this point, a cynic would quote John Maynard Keynes who wrote, "Worldly wisdom teaches that it is better for reputation to fail conventionally than to succeed unconventionally..." This may, unfortunately, be particularly true in the world of institutional investing.

classes over time, so that you hold more of an asset when its expected risk premium is larger. This is a form of tactical or active asset allocation, but one that moves more slowly than a GTAA approach. Likewise, if you believe that certain styles of active management go in and out of favor, you should adjust those as well.

If you accept this idea, what should you do? First build tools to simply monitor these things. This doesn't mean fancy quant models; it means monitoring say 5-year horizon returns and looking for one or more of the following situations:

- for major or minor asset classes (e.g., global stocks), large absolute standard deviations of recent realized returns compared to history
- for comparable asset classes (e.g., domestic vs. international stocks), large relative standard deviations between like asset classes
- for active strategies, large standard deviations of recent returns relative to benchmark (including a benchmark of cash for a truly market-neutral manager)
- where direct valuation measures exist and are robust over long-periods (like Exhibit 1A showing on expected U.S. 50/50 stock/bond returns), build simple guidance tools based on these.

Try to start with the presupposition that something highly beaten up is a candidate for addition (and vice versa, something that has been extraordinarily successful is a candidate for reduction). Of course, we are also believers in shorter term momentum, so even given extreme valuations (or 5-year returns) it may pay to wait until you see some stabilization. Things rarely return to fair value overnight. You may actually increase your expected return if you give up trying to time the exact peak or trough.

In particular, regarding active managers, we have the self-serving view that investors often do not give them enough time. A manager with a true net-of-fees and factor exposures information ratio of 0.50 is very valuable, but will experience many down years, and some down 3-5 year periods. It's fine not to believe in alpha to start (in fact, it's a strong rational starting point) – but if you did believe in a manager enough to hire them, then if you see returns that are well within the probability distribution (but negative), it probably should not change your view. One rule I think makes sense is to resolve that when a manager stinks (technical term) over some reasonably long period, you are either redeeming because you have learned something new, or adding more money. That might seem extreme, but I think it would be a valuable discipline. Quite a few investors practice only one side of this rule (the redeeming side) and are acting precisely opposite to the empirically strong value strategy.

Along with being a contrarian, long-term investors should be able to earn a risk premium by providing liquidity when short-term opportunities present themselves. These opportunities may come in a market or an active management strategy that falls out of favor very suddenly, typically against the backdrop of some kind of panic or market dislocation. Examples would include October 1987 for stocks, August 1998 for a range of asset classes, May 2005 for convertible arbitrage strategies, and August 2007 for market-neutral quant equity strategies and late 2008 for almost any risky strategy, but particularly investments like convertible bonds and other illiquid credit-sensitive investments. In essence, this is an equally contrarian style of investing, but one that plays out over a much shorter time horizon. The key to be able to take advantage of these opportunities is the ability to deploy capital quickly when they arise and to tolerate some period of possible loss, because determining when they have hit "bottom" is far from an exact science. (This was certainly true in 2008, when assets that had become very cheap suddenly became astonishingly cheap – a reminder that investors pursuing a liquidity-provision strategy should usually keep some "dry powder" in case it turns out they have moved into a beaten-up asset just before it gets truly beaten down). This type of investing may pose a governance challenge for investors who require board approval for these types of capital allocations, but those who can pre-commit to specific strategies or earmark some small percentage of their investment capital for tactical opportunities may earn a meaningful advantage. At the end of the day, the key is to be a provider of liquidity rather than a demander of it.

One complicating factor for contrarians: peer group comparisons. Increasingly investment staff – particularly at endowments – getting paid on these. This has some good aspects of course, but here I'll raise fears. It clearly shifts the world to relative returns (duh!), and that will mean to outperform you need to take more risk than others (maybe a good thing for the wrong reasons?), and all bets will be defined vs. others (e.g., you need to own not just x% real estate, but x% more than Harvard and Yale). Amazing how what used to be "absolute return" becomes relative huh? I wouldn't eliminate these comparisons, but I would try to make it only part of compensation, and try to make it use the longest rolling period of returns people can tolerate.

Finally, remember that being a contrarian isn't easy. By definition, you will being going against conventional wisdom – and conventional wisdom is often based on logical judgments and real-world observations (e.g., China and other emerging markets will need more energy as they grow, so oil demand is likely to increase). But conventional wisdom doesn't always get the math right (e.g., historically, increased demand for energy has been met with increased supply, conservation or substitution) and tends to over-extrapolate short-term history at the expense of long-term results. The key point is this: there is potentially huge value in being a contrarian, but you have to go into it knowing how difficult it can be. But that's probably why the strategy pays off.

7. Be Innovative in Combining Market Beta, Hedge Fund Beta and Alpha

What do you do once you have all of the pieces above in place? To summarize the recommendations thus far, seek alpha wherever you can find it, give out less constrained mandates when possible, and look for managers truly hedging out market risk and other betas (or if possible hedge out yourself). At the same time, build a diversified portfolio of market exposures adjusted to a comfortable level of expected volatility. Include a healthy exposure to risk premia that fall in between pure alpha and market beta – the "hedge fund betas" or active management betas described earlier, particularly if they are at low cost and with favorable investment terms. Use the paradigm in Exhibit 5 below to run your overall portfolio.

This splits both on alpha/beta, and on liquidity, which is meaningful enough to be a high-level category.

We now have come to even more fully respect that illiquid investments – particularly private equity – have some important downsides. One problem is that it can be quite difficult to set (and achieve) a target allocation over time. Values for private investments can be elusive, which means it may be hard to judge at any point in time how much of your portfolio is allocated to privates. And in a market collapse (like 2008), private investments may come to dominate your portfolio and/or be difficult to rebalance.

The most important concern about private equity may relate to liquidity. We noted earlier that investors should be able to monetize their long time horizons by investing in assets that earn a liquidity premium. And as just described, investors may be able to earn outsized returns by providing liquidity and capital to markets that are starved of them. But private equity does not always operate this way. For example, it's not clear that leveraged buyouts (taking control of a public company, usually at a premium, with the goal of re-selling it later as a whole or in parts) should really earn a liquidity premium.[16] Investors are creating an illiquid asset out of a liquid one, and that doesn't necessarily earn a positive return. More perniciously, over the last few years, private equity has been a strategy that has returned capital to investors at a time when the markets were flush with liquidity (meaning investors got a ton of cash when they had few good places to put it) and then demanded liquidity when markets were starved for it (meaning investors

Exhibit 5: A Model for Portfolio Construction

	Market Beta	Hedge Fund Beta	Pure Alpha
Liquid	Best combination of market exposure (not necessarily at market weights) to create best risk-adjusted portfolio Lever the portfolio if not aggressive enough, or de-lever if too aggressive	Diversified portfolio of dynamic risk premiums (strategies that are not just buying and holding an asset class) Includes unique risk factors associated with many active management strategies, not just hedge funds	Source alpha wherever you can find it Will be lower-cost to separate alpha from market beta and hedge fund beta
	Pay very little	*Pay modestly*	*Pay a lot*
Illiquid	Strategies that earn an additional premium from holding illiquid investments. These may combine both market beta and manager alpha.		

[16] Some private equity strategies, such as venture capital, should earn a liquidity premium, since they are providing capital to companies who cannot tap the public markets. But the liquidity premium for buyouts is much less clear. And while we recognize that managers can potentially add alpha by improving the operations of a public company once they have control, they have to add a substantial amount of value to overcome the fees and costs associated with the strategy.

were forced to divert money away from very attractive investment options because of capital calls).[17]

I'm not sure what all of this means for the future of private equity, but I think investors should be cautious and should make sure that the bulk of their private strategies are providing liquidity when it is urgently needed (think venture, distressed, and perhaps certain forms of lending) rather than simply using financial engineering to generate returns.

Ultimately, Exhibit 5 does more than simply illustrate how an investment portfolio should be organized – it also points the way for how institutions should begin to think about organizing their investment staff. However, it could, and probably should, grow into a complete paradigm for team organization in the long run. And it may well be the right approach for oversight boards to use in setting investment strategy and assessing the results. In particular, deciding how much time and effort to allocate to each of the four boxes is a critical decision. It is also one that, if poorly done, can lead to a vast waste of resources in minutiae, but if well done can pave the way for much future success.

Constructing your portfolio along these lines, and building up each box along the guidelines described above is no guarantee of success. (If there were any guarantees of success, you wouldn't need to read this!) But individually and collectively, we think these ideas offer a reasonable, coherent and practical way to address the many challenges institutional investors face in all market environments, and in particular today.

Summary of Recommendations

If these seven thoughts are simply too many for you to remember, consider the following list, which boils the same concepts down into three simple ideas:

1. **Risk-taking is the key to investment success.** How much risk you can comfortably take is the most important predictor of long-term returns.

2. **If you're taking risk, do it as efficiently as possible.** Diversify your risk exposures to include as many different and diversifying sources of risk, including dynamic risk premiums (what we call "hedge fund betas").

3. **Set clear goals and communicate them well.** We believe an imperfect strategy that you can stick with through tough times will almost certainly outperform a perfect strategy that you have to ditch when the going gets rough.

If these three ideas are too many, consider the following:

> ***Be truly long term.*** *Work to get the whole organization to take a long-term perspective, as this is far and away the most important take-away of this note.*

Finally, as you can tell from our introduction, these Seven Thoughts are a work in progress and we would welcome the opportunity to hear your perspective on these issues.

[17] The experience of 2008 showed that even sophisticated institutions can get caught in a liquidity trap when there is an imbalance between distributions and capital commitments. Anecdotally, we heard of many institutions who, in order to raise needed capital, faced the choice of unloading some of their private equity stakes at substantial haircuts or selling their more liquid investments at depressed prices (just when they were supposed to be rebalancing into them).

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