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Lessons from the Woodshop:
Common Sense in Managing and Measuring Leverage

The use of borrowed money is a subject of vigorous debate, particularly since the onset of the credit crisis. Whether in the context of national balances of payment, company balance sheets, investment fund risk profiles, or household finances, the use of leverage tends to elicit strongly held views.

This installment of *Market Insights* examines two broad aspects of leverage that merit consideration by investors evaluating levered investment portfolios. First, we believe that many observers ascribe much importance to the *quantity* of leverage used, but not nearly enough to its *quality* and intended purpose. Second, investment managers, investors, and regulators often employ different and inconsistent methods of measuring leverage.

Put simply, folks think a lot about the question, "How much leverage?" but not very much at all about the questions, "Why is the leverage being used?", "Under what terms and conditions is the borrowing being done?", and "How is the leverage quantity being computed?"

D E Shaw & Co

Remember the Woodshop Teacher

Leverage and power tools share three fundamental properties: they can be extremely helpful, they can allow for far greater precision, and they can be really dangerous, even in the hands of experts. We would wager that some of us who took a woodshop or metalshop class in high school had instructors—however masterful a carpenter or machinist—who were missing at least one finger due to a moment of inattention while operating a table saw.

Let's immediately make the obvious point that access to leverage creates opportunity and potential risk. The simplest objective of leverage is to do more with less. As an example, leverage can allow investors with higher return targets to invest in assets with expected unlevered returns that don't meet their bogey. For some investment strategies, especially in the fixed-income and currency spaces, leverage creates the economic basis for exploiting small market inefficiencies that may not be sufficiently profitable on an unlevered basis.

At the same time, though, leverage can be used to amplify risks to which a portfolio is already intentionally or unintentionally exposed. The following are some of those risks.

- **Volatility amplification—**Leverage can increase the size of a portfolio's exposure to a given investment, and, in turn, the increase in exposure would result in higher volatility and risk.
- **Loss-liquidation-loss feedback loops—**Levered investors can lose *more than all* of their invested capital. Consequently, an investor who employs leverage may leave himself vulnerable to a self-reinforcing downward spiral when the price of an asset moves against him. Concentrated exposure to a financed asset means that a relatively small price move could translate into a large capital loss, which may in turn force the investor to sell assets to meet margin calls. The sale of assets then puts further downward pressure on the asset's price, creating a familiar, vicious cycle of margin calls, forced sales, and adverse price movements. This contrasts with unlevered investors who, in the absence of margin calls, are never compelled to liquidate if they prefer not to.

The two preceding points are ways in which leverage can increase the quantity of *asset* risk. But the application of leverage introduces a new and distinct set of *financing* risk factors. Broadly speaking, these financing-related risks can be grouped into two categories.

- **Counterparty risk—**A borrower has exposure to the lender if, for example, collateral the borrower has posted with the lender were to become inaccessible or to vanish altogether with the lender's insolvency.
- **Funding instability—**Just as investors must pay attention to the stability of their equity capital base, they also must anticipate instability in their debt. (It seems to us, by the way, that many market observers pay far too little attention to debt stability, about which we'll say more in a moment.) This instability takes its most spectacular form in a "run on the bank" scenario like the following: imagine that an investor suffers from an unstable financing structure and that this weakness becomes recognized by the Street. His leverage providers then begin defensively pulling their credit lines to him, which in turn could force the investor to sell assets. Exiting a position under duress will likely cause a loss of capital, which can broaden or exacerbate the loss of funding (particularly if the leverage contract is subject to the "NAV triggers" common in many lending arrangements), and so forth, until the investor's financing dries up completely and his portfolio has suffered substantial losses. In this case, the vicious cycle was probably not initiated by an adverse general market event, but instead by some more specific cause. Examples of precipitating local events might be the expiration of the investor's leverage arrangement, a lender that encounters liquidity problems, a sudden change in the investor's leverage terms, a financial report or disclosure that brings the financing structure to light, or exploitative behavior by market participants seeking to capitalize on the apparent or merely potential distress of the investor.

Risk-Reduction through Leverage? Yes, It Can Be Done!

It's important to recognize that, while leverage can be a source of risk, leverage and risk aren't the same. In fact, when conceived not as a means of increasing market exposure but rather as a way of extending "balance sheet" per unit of capital, leverage can be used simultaneously to *reduce* some kinds of risk and to enhance expected return.

Let's consider a hypothetical fund manager with $1 million who decides that, rather than taking an unlevered long position in investment-grade debt that has an expected annualized return of Libor + 1%, she will use leverage to purchase $10 million of the debt with $1 million of capital, increasing the expected return of her investment to Libor + 10% (assuming the investor funds at Libor). Although this ten-fold increase in exposure to the investment-grade debt adds value by bringing a higher return target within reach (which is how some view the benefits of leverage), it doesn't improve portfolio quality as measured by the portfolio's expected Sharpe ratio or other risk-adjusted return metrics.

To see how leverage might be used to mitigate some risks, consider the following example. An investor wants to put $1 million to work and believes a given automobile stock is expensive relative to its industry peers while a certain technology stock is cheap relative to its own industry peers. This investor is otherwise agnostic on where the overall stock market or the auto or tech sectors in particular are going. Without access to leverage on the long side, the best the investor can probably do is to short the auto stock and buy the technology stock, capturing some of the relative value and hopefully hedging out most overall stock-market risk. But with access to leverage, the investor could further sharpen the bet by, first, hedging the short position in the auto stock with a basket of long positions in other auto stocks and, second, hedging the long position in the technology stock with a basket of short positions in other tech names. The use of leverage in this second example has two benefits:

- it allows the investor to isolate more precisely his investment thesis (that the stocks are mispriced *relative to their industry groups*) and focus the investment on his precise area of expertise, which increases expected return; and
- it reduces his portfolio's exposure to industry group risk and expected volatility.

So by using leverage, the investor has increased the expected return of the portfolio and decreased expected volatility and exposure to a big risk factor (industry group moves) this investor has no real opinion on. This precise and careful application of leverage is the table saw at its best.

While we're discussing the concept of risk reduction through careful use of leverage, let's discuss two hypothetical funds with equal capital, both of which hold long and short positions in the same set of U.S. common equities. Fund A is 140% long and 60% short, while Fund B is 200% long and 200% short. Both funds borrow under identical terms. We're continually surprised at the number of market observers who would unhesitatingly call Fund B riskier than Fund A. It's certainly true that Fund B has a larger notional book, and that this entails certain forms of added risk. But in terms of overall market risk, Fund A, which is 80% net long, is meaningfully riskier than Fund B. Fund A may also have larger industry and sector bets, and may be less diversified by position given its smaller notional size. Most counterintuitively to some observers, Fund A, despite its smaller leverage, may well have *more financing risk* than Fund B because losses related to its market exposures might in turn create financing problems. This is not to say Fund B is less risky than Fund A. It's just to note that the risk analysis benefits from more than a simple comparison of raw leverage quantity. The potentially misleading nature of headline leverage figures is often well understood in other contexts. American Airlines, Ford, and Qwest Communications, for example, all currently have a negative leverage number, since their balance-sheet equity is negative, despite the fact that each company has a market capitalization of multiple billions of dollars.

Returning to the sphere of fund management, the issue, at its core, is that people sometimes act as if risk or volatility is proportional to the amount of leverage employed. But this is true only if leverage is used to proportionately increase the size of all positions instead of being used (in addition to increasing position size) to reshape the portfolio in potentially helpful, risk-reducing ways. If one accepts that leverage can be both a direct source of risk and a tool through which investors modify (by increasing or decreasing) their exposure to other risk factors, there's still room to give an account of how to think about leverage as one of many risk factors in the portfolio construction process. Let's turn to that now by considering the "quality" of a portfolio's leverage arrangements.

The Quality of a Financing Arrangement

We believe that, although much attention is paid to the quantity of leverage employed, far too little is paid to its quality. What determines the quality of a particular financing arrangement? We suggest that at least six factors should be considered.

- **Term—**Longer lending commitments improve financing quality and are especially important when financing longer duration assets. Matching longer duration assets with longer-term liabilities reduces the risk that financing will be lost before the asset matures. This is particularly the case when leveraging illiquid positions, since it generally takes more time to obtain backup financing, and it's more costly to sell the assets. The recent experience of structured investment vehicles (SIVs), which issued short-term liabilities to finance long-term assets, is a good illustration of this point.
- **Haircut/initial margin size—**Other things being equal, it's better to have a lower "haircut" on cash instruments (or lower initial margin when entering into swaps). This is primarily because these forms of collateral are generally subject to counterparty risk. A lower haircut also frees up capital that can be put to more productive use elsewhere.[1] A haircut is similar to a down payment when financing a home. A smaller down payment (and thus higher loan-to-value ratio) generally means the buyer will have more cash on hand for other purposes. A larger down payment (and lower loan-to-value ratio) generally means the lender has mitigated more default risk.
- **Haircut stability—**Constant haircuts are also favored over "variable" haircuts—which allow a counterparty to increase the haircut depending on market conditions—because the latter are most likely to be increased at inopportune times (when capital is most precious). Capital market lenders occasionally attempt to link margin requirements to historical risk data, such as value-at-risk ("VaR"), on the asset being financed. Such provisions would effectively allow the leverage provider to increase the margin in a crisis, which would amplify a borrower's risk exposure and negate the benefits of term financing by effectively forcing the borrower to refinance at an inopportune time. Such provisions are analogous to rating triggers that compel corporate or sovereign borrowers to accelerate debt repayment or increase the coupon rate when downgraded by a credit rating agency. When rating agencies downgraded AIG in 2008, triggers in contracts written by the insurer hastened its downfall.
- **Stability of financing counterparty—**It's preferable to deal with a stable counterparty that, relative to less stable leverage providers, is (1) less likely to default, meaning the haircut is exposed to less risk; (2) less likely to violate contract terms or act aggressively in times of stress; and (3) more likely to be a better partner in normal market periods and more willing to work with borrowers on new investment initiatives (such as capital expenditures for corporate borrowers or new fund launches for an asset manager).
- **Valuation and other rights—**A good financing arrangement typically has a fair mechanism for pricing the financed asset. (Recall that the 2007 implosion of two Bear Stearns hedge funds, perhaps the most commonly identified initial signal of the recent credit meltdown, was triggered by a pricing dispute, namely one between Bear and its financing counterparties over the value of the funds' collateralized debt obligations.) If a lender controls the valuation mechanism by serving as "calculation agent," it can effectively increase the haircut by marking an asset below fair value. If an investor determines the valuation, he can effectively withhold margin from the lender by marking an asset higher than fair value. It's common for lenders to attempt to control the valuation process, arguing that their trading desks are in a better position to know prevailing market prices. Some attempts at control may be more subtle than directly determining marks, such as provisions allowing the calculation agent to determine whether there has been a "market disruption event." While these sorts of events may seem remote, it's also clear they do in fact happen from time to time, and these related provisions could be critical in a crisis and thus constitute an underappreciated source of correlated risk. Given the above considerations, we generally seek margin-dispute resolution provisions that are fair to both parties, like third-party arbitration, and more generally try to ensure that such fair mechanisms continue to apply in outlier scenarios.
- **Cost—**Obviously, a manager should deploy borrowed capital only if doing so increases her portfolio's overall utility after factoring in the borrowing cost. If an

[1] An investment manager's posting lower margin doesn't necessarily mean she's thereby increased her leverage (and risk). Some investors confuse the haircut with the additional cash a manager typically sets aside to support a given position. A simple example may be helpful. Imagine that a fund manager believes that levered asset X would prudently require total supporting or "buffer" capital of $1 million. This is the capital that the manager considers necessary to allow for market fluctuations and other contingencies. If the leverage provider requires an investor to post a fixed sum (as is currently the case for credit-default swaps) of, say, $300,000, that haircut amount should not count towards the $1 million buffer because it's not available for use by the manager.

investment manager's utility function is simply to maximize return, then the cost of leverage needs only to be less than the expected return enhancement. Usually, though, the manager would like to improve the portfolio's return profile on a *risk-adjusted* basis, perhaps as measured by its Sharpe ratio, not just (or even at all) in absolute terms. As we'll show below when discussing reporting, a risk-adjusted approach to calculating the cost of capital highlights the importance of assessing a portfolio's exposures to certain risk factors in order to gauge the overall riskiness of the investment.

Relatedly, although it is beyond the scope of this piece to go into great detail, it's worth noting that negotiating success with counterparties in many of the areas noted above is heavily influenced by the stability of the equity capital of the borrower. For example, the more restrictive an investment vehicle's liquidity terms (and thus protective of the fund's equity capital base, especially in a meltdown situation), the more comfortable the financing provider is likely to feel in extending the term of financing or otherwise enhancing the stability of the borrowing arrangement. This relationship doesn't get discussed much in the broader investment community, but is very important.

The Much Maligned Derivative: A Source of Relatively Safe Financing

This isn't an especially widely held view right now, but, used appropriately, the derivatives market is a useful store of potentially risk-mitigating financing tools. One reason for the success of certain derivative products is that they embed many of the high quality leverage features noted above, which makes them very efficient and, believe it or not, lower-risk instruments (relative to cash equivalents) for expressing investment views.

Consider the comparison between a corporate bond and a credit-default swap ("CDS") on the same corporate issuer: the financing on a cash bond is typically short term, medium haircut, and medium cost (relative to Libor), and entails contractual terms and conditions that are open to negotiation. A CDS, on the other hand, has "embedded" financing because it's what's referred to in the industry as an "unfunded" instrument. In this case, it means the asset is an exposure to a possible credit event that doesn't involve the transfer of cash other than collateral paid by the swap client to mitigate the dealer's counterparty risk. One could describe this embedded financing as long term, low-to-medium haircut, low cost, and having more standardized terms and conditions. Levering a cash bond to increase credit exposure will typically involve three-month rolling financing; by contrast, writing (selling) a CDS on the same name offers similar exposure without the financing risk because, quite simply, there is no financing to lose.[2] We will have more to say about derivatives in a moment.

Managing Leverage from a Portfolio Perspective

We've talked thus far mostly about financing as applied specifically to a given asset or group of assets, or as obtained from a specific counterparty under a specific set of terms. But let's focus now on financing as a group of liabilities that should be managed as a rational whole. Modern portfolio theory has made considerable progress on the challenge of managing a portfolio of assets, but, as pension executives can attest, academics have historically devoted much less attention to managing a portfolio of liabilities. We think the latter is crucial. Fortunately, many of the principles of managing assets also apply to managing liabilities.

- **Diversification—**Diversifying liabilities reduces overall portfolio risk. This principle applies to financing counterparties, the types of assets being financed, and the types of financing structures being used.
  - **Counterparties—**It would be risky to rely on too few counterparties because a given counterparty may become unwilling to continue financing assets or, worse, default. Our firm spends time considering elements of commonality among different financing counterparties—for example, how the counterparties fund themselves (*e.g.,* deposits, commercial paper, *etc.*)—in an effort to manage potential increases in the correlation of the default risk of our counterparties.
  - **Asset type—**By the same logic, it would be risky for an investor to finance only a few types of assets. To take an extreme example, suppose a fund that invests

[2] In the future, a significant percentage of credit-default swaps, and possibly other derivative contracts, may be cleared through a central clearinghouse. In that case, the financing embedded in derivatives would be more variable because the clearinghouse could increase margin requirements over the life of a contract. Still, it's possible that some of the same benefits of standardization that have resulted from futures exchanges could result in credit-default swaps retaining many of the financing benefits as compared to levering cash bonds.

in only convertible bonds and asset-backed securities ("ABS") obtained all of its leverage by financing its convertible bonds. If financing counterparties temporarily dislike convertibles for whatever reason (consider what happened to the convertible bond market in 2008 when regulators temporarily banned or otherwise more tightly restricted the short selling of common equities), this fund would have to scramble to set up ABS financing arrangements. This might be a slow and difficult process, and the investor would probably be in a weak negotiating position.

- **Financing structure—**It may be productive to exploit a variety of financing sources, whether explicit (such as loans) or implicit (such as various derivative contracts). Companies often attempt to diversify their financing by obtaining revolving credit lines, term loans, and other forms of secured and unsecured debt. In the same way, asset managers typically look to various financing sources—including prime brokerage, swaps, and repurchase agreements, to name a few—to diversify the risk of changes, whether evolutionary or sudden, in availability of different leverage sources.

- **Term structure—**The term structure of a fund's liabilities should be managed with an eye towards the term structure and liquidity of its assets. This principle applies to all financial institutions. A longer, or more "termed-out," liability structure is usually more expensive than shorter-term financing. However, as some institutions and funds learned the hard way during the recent financial crisis, the ultimate costs of having an inadequate liability term structure can be enormous. One way to model this trade-off is to view the added cost of longer-term financing as an insurance premium for protection against cataclysmic losses of shorter-term financing in crisis events. If a given trade is expected to be profitable *only* when using inexpensive short-term financing and not more expensive long-term financing, this may mean that the trade's apparent value derives purely from financing or "roll" risk and thus that it's not such a great trade in the first place.

- **Stress testing—**Running stress tests on liabilities is as important as running them on assets. One can run liquidation scenarios of various forms: what would happen if certain categories of financing dry up? How much cash could be raised if a fund is willing to lose a certain amount by selling assets under adverse market conditions? It can also be helpful to monitor various static measures, such as the ratio of available cash to the amount of financing on harder-to-fund assets. The basic intent of these stress analyses is to contemplate a variety of awful financing climates in order to avoid taking on too much leverage.

Reporting Leverage

One of the challenging aspects of leverage is deciding how to quantify it for reporting purposes. In our complex financial system, this has long been a matter of debate, but the issue has taken on greater relevance in the recent global financial crisis. Because the crisis engulfed a variety of large financial institutions in alarming ways, some policymakers have broached the idea of placing limits on leverage, often fairly uniformly across disparate categories of market activity and without really explaining the basis of measurement.

For example, the European Commission's April 2009 draft directive on Alternative Investment Fund Managers expressed concern about any leverage level above 1x equity capital and proposed (among other things) the imposition of a fixed cap on the average amount of leverage employed by affected investment management firms (while acknowledging that such limits should vary with the type of strategy and firm deploying the leverage and with the sources of leverage involved). More recent debate within the European Union has largely moved away from the notion of strict, somewhat brute-force limits and toward empowering regulators to monitor leverage and to impose limits only when they perceive a significant risk to the financial system. Placing limits on leverage, even when tailoring them to individual strategies or firms, presupposes being able to *measure* leverage in a consistent and reasonable fashion.

Although there's been much discussion lately among regulators, accounting standards boards, and industry associations about how best to measure leverage, there's still no consensus, and different measurement methods can result in very different outcomes. Investment management firms, too, are engaged in a form of implicit debate on this topic by virtue of the different methodologies they employ when reporting leverage levels to investors or creditors. In our opinion, too many investment managers have adopted approaches to measuring and reporting leverage that meaningfully understate or otherwise obscure the actual

leverage of their portfolios. At the same time, investors and their consultants often unwittingly compare one hedge fund's leverage "apples" to another fund's leverage "oranges." The treatment of derivatives for purposes of leverage reporting is a case in point.

Context Matters When Calculating Leverage

As noted earlier, we believe that, from a portfolio management standpoint, certain derivatives may offer advantages because they are unfunded instruments. High quality leverage, though, isn't the same as no leverage at all, even if some measures of leverage might suggest otherwise. Under U.S. generally accepted accounting principles (U.S. GAAP), the notional exposure of certain derivative contracts is not recognized on the balance sheet. If leverage is measured simply in terms of balance sheet assets, then derivative exposure may not be meaningfully factored into leverage calculations.

Consider the differences between funding a cash instrument and an unfunded derivative. For example, writing a CDS for $10 million notional on a corporate credit offers economic exposure roughly similar to buying $10 million of the same issuer's cash bond with financing. The swap's notional exposure would be off-balance sheet under U.S. GAAP. On the other hand, if the investor purchases $10 million of the credit on traditional prime brokerage margin, the asset and liability would appear on the balance sheet and thus increase the balance-sheet leverage of the portfolio. A fund manager may therefore find it doubly expedient to report to investors *solely* on the basis of U.S. GAAP balance-sheet leverage because the leverage calculation is relatively uncomplicated and the output downplays (possibly a lot) the amount of leverage actually employed.

Although there are clearly some limitations associated with this balance-sheet approach, it's also important to recognize how alternative approaches that factor derivative exposure into leverage calculations (let's call these alternative methods "derivative-adjusted leverage" for convenience) can create their own problems. For one thing, derivative-adjusted leverage figures don't indicate how much financing a fund is using. A 4x derivative-adjusted leverage number doesn't necessarily mean that a fund is borrowing 3x its equity capital. It's possible that the 4x figure stems from exposure to unfunded derivatives, and therefore the fund is not actually "borrowing" much money at all. Also, certain derivatives may balloon headline leverage numbers even though the instruments in question don't meaningfully increase portfolio risk or create any additional financing risk. Consider a pair trade in which a fund takes a $1 billion long position in an investment-grade credit index and a $1 billion short position in a nearly identical index, and the maximum loss is $20 million. Even though the maximum loss is relatively small, the additional $1 billion on the long side would greatly expand the fund's long derivative-adjusted leverage number. The same is true of interest-rate swaps: their notional values, and thus the nominal leverage, are large relative to the amount of risk involved.

Another example of how context matters is the *location* of leverage. For example, Fund A invests in distressed companies that may be levered only 1x at the fund level, but the underlying investments may be levered 10x at the company level. By comparison, Fund B invests in investment-grade debt that is levered 2x at the company level and applies 5x leverage at the fund level. Although the leverage is non-recourse to external investors in both funds, for Fund A the preponderance of the leverage is non-recourse to the fund as well, which is not true of Fund B. But the overall market risk and leverage of each fund are essentially equivalent despite the radically different headline leverage numbers; the major difference is simply *where* the leverage is applied.

Transparency through Multiple Leverage Figures

We've devoted considerable thought to the reporting of leverage. Simply put, we believe more information is better: different metrics can help make sense of the nuances surrounding the measurement of leverage levels. This is why we think it's generally most appropriate to use at least both of the broad calculation methods (balance-sheet leverage and derivative-adjusted leverage) outlined above.

In that respect, we believe that drawing conclusions about the risk profile or other characteristics of investments by comparing raw aggregate leverage figures is at best incomplete and at worst highly misleading. Gauging the impact of leverage on a fund (or one of its underlying investments) requires a deeper and more nuanced understanding of how leverage could interact with a number of risks, including market directionality, concentration, illiquidity, value/growth style biases, capitalization, subordination, and other factors. Just as we believe it would be unwise to evaluate a fund on the basis of a single measure of aggregate risk (whether it be VaR, historical volatility, downside deviation, or similar metrics) independently of its exposures to the common risk factors cited above, we believe that evaluating leverage using a single number,

whether comparatively or in isolation, offers insufficient insight into the potential implications of the leverage applied.

In keeping with these views, we believe the following leverage metrics can be helpful in considering the leverage of a given investment vehicle:

- **Long derivative-adjusted leverage—**long market value of cash and derivative instruments divided by total investment vehicle capital;
- **Net derivative-adjusted leverage—**net market value (absolute value of the amount that results from netting all long and short market values) divided by total investment vehicle capital; and
- **Balance-sheet leverage—**U.S. GAAP balance-sheet assets divided by total investment vehicle capital.

Reporting multiple figures is consistent with our earlier discussion about understanding the trade-off between opportunity and risk because multiple leverage calculations can help illuminate underlying exposures. Although long and net derivative-adjusted leverage convey important information about the risk-profile of specific investment strategies, the juxtaposition of these figures with the aggregate balance-sheet leverage of an investment vehicle offers some important insights into how efficiently that vehicle is deploying its capital, its exposure to the stability and creditworthiness of its financing counterparties, and the potential for leverage to amplify risks to which the portfolio may already be exposed.

To illustrate these points, consider a fund deploying a simple long/short credit strategy with a total of $100 million of investor capital and access to prime broker leverage and the swap market. (For convenience, we'll ignore the issue of buffer capital.)

- The fund invests $60 million in cash bonds.
- Using the bonds as collateral for prime broker financing, it obtains a total of $300 million in long exposure to cash instruments (including the $60 million above).
- The fund also posts $40 million as initial margin when writing CDS contracts to secure another $200 million in long exposure.
- The fund seeks to hedge its long exposure by entering into CDS that provide $500 million of short exposure.

Using the three leverage metrics above and assuming no PnL, such a fund would exhibit the following exposures:

- **Long derivative-adjusted leverage:** 5x
- **Net derivative-adjusted leverage:** 0x
- **Balance-sheet leverage:** 3x

Inclusion of long derivative-adjusted leverage in this fund's reporting affords important transparency about the leverage level employed. First, it's important that investors understand the magnitude of a vehicle's long exposure. For example, although long and short exposures may track each other relatively tightly under normal market conditions, that may not be the case when markets enter periods of stress. The potential for such "basis risk" (see *Market Insights* vol. 1, no. 1) within specific asset classes highlights the importance of understanding derivative-adjusted leverage. This method offers investors a nice comparative baseline for evaluating the risk profile of different funds or strategies.

Second, the combination of the long derivative-adjusted and balance-sheet leverage figures provides some insight into the degree of stability associated with the leverage. In the simple example above, the fund borrows $240 million from the prime broker, meaning that less than half of the portfolio's long market value is exposed to funding risk because there is no potential loss of borrowed funds on the CDS. The U.S. GAAP balance-sheet leverage figure indicates that the fund is borrowing closer to 2x its total capital rather than the 4x implied by the long derivative-adjusted figure. Finally, as we have seen, a 5x leverage figure should be viewed in light of a vehicle's overall exposure to market risk and in particular its exposures to risk factors that are common to many market participants. The above fund's 5x derivative-adjusted leverage may seem high relative to another fund's 2x derivative-adjusted leverage, but if the net derivative-adjusted leverage for the second fund is 1x and that is associated with a large directional market exposure, it's not clear that the above fund presents more risk.

Having seen how context matters when interpreting the meaning of leverage figures, we attempt to adjust for distortions that may arise when factoring derivative exposures into our reporting. Interest-rate swaps, for example, typically involve large notional exposures relative to the risk that is taken on by the investor. When

calculating our leverage figures, we convert interest-rate swaps to 10-year bond-equivalents and net those exposures off against instruments with similar maturities but opposite exposures.[3] We do so because interest-rate swaps don't reference underlying cash instruments, and their notional values aren't tied to the market value of an equivalent asset. Including the notional values of interest-rate swaps when calculating the long or short market value of a portfolio would typically dwarf the leverage of other strategies in that portfolio. Combining the disproportionately larger gross market values of instruments with low sensitivities to market movements with instruments having smaller notional values but relatively higher sensitivities to market movements (such as total return swaps on non-G3 sovereign debt) might lead an investor to assign much higher effective leverage to the second set of instruments and thereby distort the "true" leverage of the strategies employing them.

The foregoing illustrations consider single snapshots in time. But given the limitations and complexities associated with calculating leverage, we believe it's also important that investors consider how these leverage figures change over time. Trend analysis, whether across different funds or underlying strategies, can shed light on how leverage levels may change as market conditions shift.

Conclusion

Over our more than twenty-year history, we believe we've amassed considerable experience and learned important lessons (sometimes at meaningful cost) in managing leverage as we seek to enhance our risk-adjusted investment results. We recall that the school woodshop teacher with the missing pinky was not only good at using the machine saw, but maybe also a bit more respectful of its dangers than newer practitioners with a full complement of digits. Here are a few key principles that we've attempted to follow in managing our liabilities:

- focus on longer-term financing sources in an effort to maintain the flexibility to manage assets in occasional stressful scenarios, even if this costs more in the short term;
- diversify both assets and liabilities to enhance the risk profile of portfolios and to obtain better, more stable leverage terms than less diversified pools of capital, in keeping with the multi-disciplinary approach to investing we tend to prefer;
- take advantage of aggregate assets under management to develop strong relationships with financing counterparties and pursue arrangements that have more balanced terms than would otherwise be available; and
- be diligent in negotiating financing arrangements and reviewing the governing documents, both when initiating those arrangements and over time.

We believe that the inherent complexity of leverage places a premium on transparently reported, multiple measures of leverage. We believe that investors will be well served by subjecting the leverage figures reported by asset managers to critical scrutiny, including evaluating leverage figures over multiple periods and across multiple vehicles and strategies using consistent measurement tools.

We're regularly surprised by the degree of importance that is attached to unadjusted balance-sheet leverage numbers to the seeming exclusion of other risk considerations. If hypothetical Fund A reports an aggregate balance-sheet leverage of 3x and Fund B an aggregate leverage of 2x, it may well be the case that Fund A is more highly levered than B. But it's also sometimes true in our experience that Fund A in this example is, when viewed through other lenses like derivative-adjusted leverage, in fact less levered, or more solidly funded, or less exposed to market risk, than Fund B. Investors will sometimes look only at unadjusted headline leverage numbers and opt for what's perceived as the "lower" leverage investment, even when that investment actually is more highly levered or otherwise riskier. And in the case where the 3x and 2x figures for Fund A and Fund B are computed using very different methodologies, a comparison between the two can be rendered even more specious.

We've hopefully demonstrated that quantity should not be the sole consideration in evaluating leverage. Equally important are the quality and riskiness of both the portfolio

[3] Such "netting" rules will be familiar to those versed in the comparative treatment of derivatives under U.S. GAAP and International Financial Reporting Standards ("IFRS"). U.S. GAAP has more liberal rules than IFRS regarding the netting of exposures to various over-the-counter derivatives and repurchase agreements. As a result, financial institutions adhering to IFRS typically report higher leverage figures than those relying on U.S. GAAP.

and the leverage supplied. One should closely analyze the interplay among a portfolio's concentration and liquidity, the expected duration of its assets, the average term of the leverage, the stability of leverage providers, and other factors. We believe managers and investors would mutually benefit from more comprehensive dialogue around the subject of leverage, even though this unavoidably means a bit more complexity in those discussions. In time, we hope those discussions will be facilitated by an increasingly shared vernacular regarding the management and measurement of leverage.

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