

Pension Solutions Investment Brief – Current topics for US corporate DB plans

US pension plans have experienced significant funded status gains in recent years due to increases in global equities and interest rates. As plans approach 100% funded status, asymmetric pension exposures present significant opportunities to plan sponsors. Plans can utilize option strategies to shape equity payoff profiles to maximize the likelihood of achieving fully funded status or surplus funded targets. In particular, plans can implement 1x2 call spreads to add at-the-money upside exposure to equities at the expense of selling distant and potentially unnecessary upside. LGIMA believes that 1x2 call spreads are an optimal strategy to achieve funded status objectives more quickly, particularly for plans that anticipate de-risking as equities rise and funded status improves.

The mechanics of the 1x2 call spread overlay include purchasing a closer to the money call (notional matched up to current long equity exposure) and selling two further out-of-the-money calls (up to 2x the notional of current long equity exposure). If equities rally through the purchased call strike price, the plan has twice the upside exposure to equities. If equities continue to rally through the two sold calls, the plan's equity exposure will eventually be called away. The strikes and notional of the call strategy should be established such that funded status objectives from changes in equities are achieved at or prior to break even.

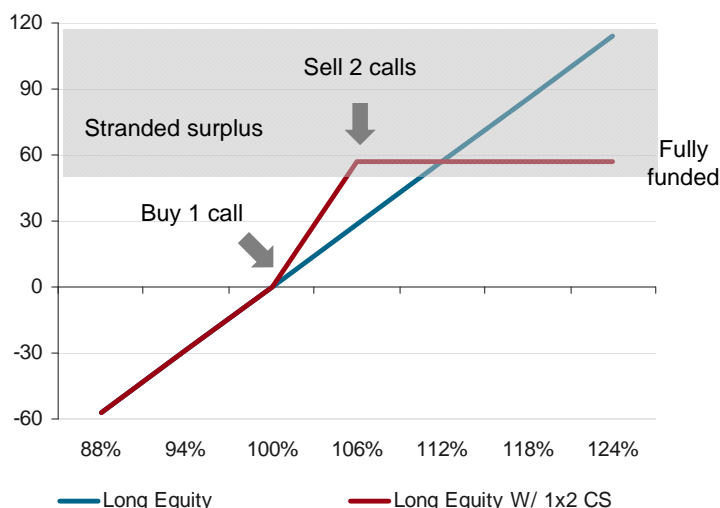
Consider a hypothetical pension plan with the following characteristics:

Example Plan (50/50)	
Assets	\$950
Liabilities	\$1,000
Funded Status	95%
Equity Allocation (50%)	\$475
Fixed Income Allocation (50%)	\$475
Status	Frozen

Implementing 1x2 Call Spread	
Long 100% Calls	\$475
Short 106% Calls	(\$950)

The hypothetical plan is currently \$50mm underfunded and has a \$475mm (50% of assets) equity allocation. The plan needs a ~10.5% rally in equities (\$50mm/\$475mm) to reach 100% funded status with its current asset allocation.

Let's assume that our hypothetical plan buys \$475mm of long at-the-money calls and sells \$950mm 106% out-of-the-money calls. For discussion purposes, we'll assume that the premium on the at-the-money call is 2x the premium of the out-of-the-money calls, resulting in zero net premium outlay.



With the addition of the 1x2 call spread, the plan earns the needed \$50mm at expiration with only a 5.3% rally at the expense of selling unnecessary upside. All else being equal, the plan has reduced the required equity return profile to reach 100% funded in half by monetizing unnecessary upside.

Market implications plans should consider when implementing a 1x2 call spread

Volatility

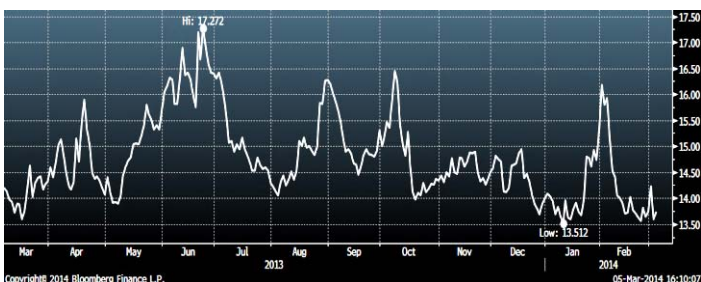
Implied volatility of an option is the volatility of the underlying instrument that the option price is implying using an option pricing model (such as Black Scholes). Buying an option will create a long volatility position, while selling an option will create a short volatility position. Adding a 1x2 call spread overlay to long equities creates a net short volatility exposure at inception. The plan is long volatility via the long 100% call, but short more volatility via the 2x short 106% call. Strategically, the position will create an attractive scenario for the plan at expiration, but plans should be cognizant of the volatility exposure as it will introduce mark-to-market risk in the interim period.

1x2 call spreads are net short volatility, as overall volatility levels increase, width in strikes and associated potential returns from the equity portfolio will be higher. It is preferable to implement 1x2 call spreads when overall volatility is high. Below is the implied volatility of the current one year 106% call (SPX Mar 2015 1950 call). In our hypothetical trade, the 1x2 structure is short \$2mm vega in typical market conditions. Vega is the dollar exposure for a one percentage point move in volatility, meaning

that if implied volatility fell 1%, the plan would have a mark-to-market gain of \$2mm (and correspondingly, a \$2mm mark-to-market loss if volatility increases 1%). It's worth noting that volatility tends to increase in periods of stress (likely a period corresponding with increased defaults and downgrades and wider credit spreads).

Even in a relatively calm year like 2013, there were strong entry points for the 1x2 structure, and entry points to avoid.

### Implicit volatility of sold call



### Skew

Skew is the difference in implied volatility between strikes. Implied volatility falls as market strike levels increase—this intuitively makes sense as rallying markets exhibit less realized volatility than falling markets.

### Implied volatility versus market strikes



Flat skew between strikes means the implied volatility difference is small and steep skew means the difference is large. It is preferable to implement the strategy when skew is flat, as the plan is selling expensive out-of-the-money calls and buying cheap at-the-money calls from a volatility perspective.

### Implied volatility differential between 100% and 106% calls (lower number implies flatter skew)

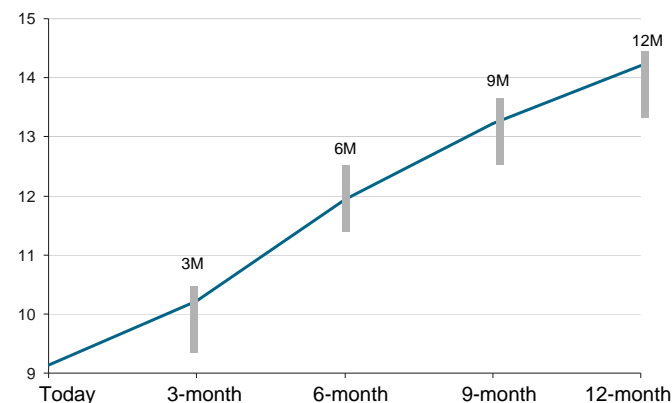


Skew remains fairly stable through time and tends to flatten during periods of increasing volatility and steepen during periods of falling volatility. In our hypothetical example, a 0.10% flattening in skew would result in a \$200k mark-to-market loss, while a 0.10% steepening in skew would result in a \$200k gain.

### Volatility Calendar

Because the 1x2 call spread is net short volatility, the calendar volatility curve plays an important role in the structure. In typical markets, implied volatility for an option will increase with time to expiry (e.g. a 1-month option will have lower implied volatility than a 1-year option). The calendar volatility curve provides the current market estimate of expected option premium decay. If the calendar volatility curve is steep, a net short volatility position (such as the 1x2 call spread) will appreciate faster as time decay occurs ceteris paribus; therefore, it is preferable to implement a 1x2 call spread in environments with steep calendar volatility curves.

### Calendar Volatility Curve



### Conclusion

Plans can utilize 1x2 call spreads to shape equity return profiles to maximize the likelihood of achieving 100% funded status. Call spreads offer many strategic advantages to shape funded status outcomes; however, plans must also consider market conditions during implementation such as overall option volatility levels, volatility skew, and the calendar volatility curve. If properly structured, 1x2 call spreads can help plans meet strategic objectives and improve funded status outcomes in a variety of market conditions.

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