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## Balancing Betas

### Essential Risk Diversification

In the long run there is significant evidence that stocks give the best long-run passive return. A diversified equity portfolio grows with the economy, so as long as we expect economies to grow, a passive portfolio of diversified equities is all we need and other assets are not really necessary for long-term investors. So why do so few investors have an equity only portfolio? First, equities can be very volatile so there is a good deal of short-term risk to achieve those long term goals. Second, the long term is generally measured as 20 to 30 years. Historically there have been plenty of 10–15 year periods where equity returns have been negative or flat. Given that most investors are active for 40 years or so (from their mid 20s to their mid 60s), it is difficult to think “long term” if equities are giving chronically low returns for 20%–30% of your active investing life.

Below is a table showing extended periods where equity returns were flat. As we can see, they happen far more frequently than we would like:

**FIGURE 1: DOW JONES INDUSTRIALS**  
1872 – 2008



Source: First Quadrant, L.P.

This need to preserve principal has led to a multi-asset framework for investing. That is, investing in asset classes besides equities. The most diversifying asset from a correlation standpoint is sovereign bonds which led to the “balanced” portfolio where a typical asset allocation of capital is 60% stocks and 40% bonds. Unfortunately, a traditional “balanced” portfolio is not really balanced from a risk standpoint. In this article we will examine true risk diversification across assets and how we can balance betas, not just capital. We will start with a typical US 60/40 portfolio and then expand the concept out to a multi-asset global portfolio of essential markets.

### The Failure of Capital “Balanced” Portfolios

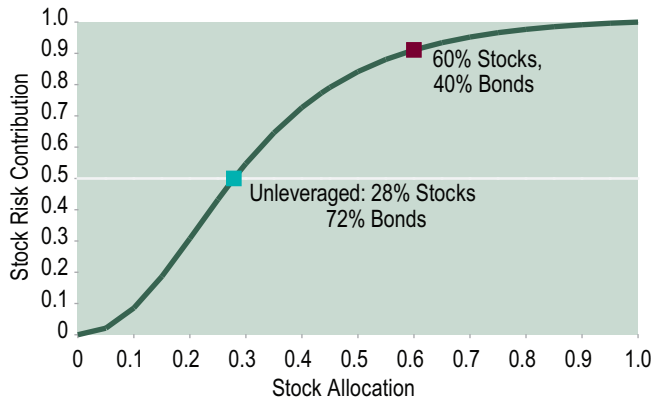
Because the 60/40 portfolio balances its capital by putting 40% of the assets in bonds, it gives the impression that its risk exposure is also balanced. Unfortunately, this is not true. From January 1986 – October 2008 the S&P 500 had an annualized volatility of 14.90% while the 10 year T-Note had an annualized volatility of 5.12% and a 60/40 balanced fund had a risk of 9.35%. So adding bonds to stocks had lowered the volatility compared to a pure portfolio of stocks. However, in variance space (where portfolio risk is calculated) equities had 8.44 times the risk of bonds, or 2.91 times in standard deviations. So if we look at the risk budget for stocks and bonds in this 60/40 “balanced” portfolio, stocks carry 91.31% of the total risk compared to the bond contribution of 4.81% (the remainder of 3.88% is in the covariance term). From a risk budgeting stand-point, the “balanced” portfolio is not balanced at all. Most of the risk is still in stocks. In fact, during the January 1986 – October 2008 period, the 60/40 had a 97.6% correlation with stocks. The bonds had “watered down” the volatility of equities, but not the risk exposure.

## Balancing Risk

It would be much more desirable to balance the risk of equities with bonds and it is clear from the above that balancing capital does not balance risk. So what capital allocation would balance risk?

**FIGURE 2: RISK BUDGETING**

*Stock/Bond Allocations Without Leverage*

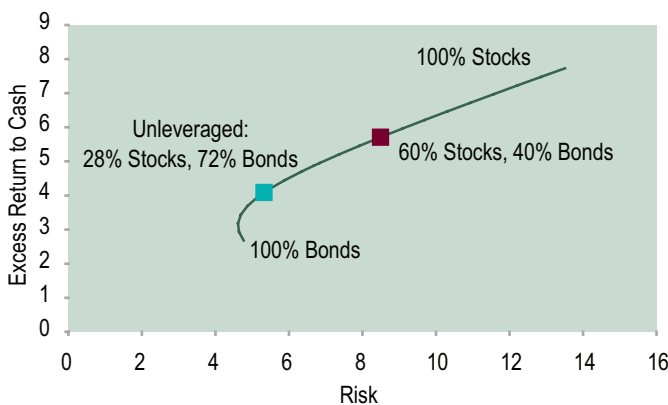


Source: First Quadrant, L.P.

Figure 2 shows the risk budget of equities as we increase the equity allocation. The X-axis shows the allocation to equities and the Y-axis shows the equity risk budget. A 60/40 portfolio, as we discussed above, has a 91% risk budget to stocks. We can also see that an equal risk budget between stocks and bonds is achieved at 28% stocks and 72% bonds. Of course, only the most risk-averse investor would want this portfolio. As we can see below, the return of this portfolio is far below the return requirements of most institutional and private investors.

**FIGURE 3: BALANCED RISK WITHOUT LEVERAGING BONDS**

*Lower Returns and Lower Risk*



Source: First Quadrant, L.P.

So, what can be done? The problem with bonds is that they have a low return and risk profile. This is particularly true of sovereign bonds in developed markets. The main risk in a sovereign bond is not default, but inflation. The only significant risk premium comes with very long duration bonds where inflation risk increases. Equities, on the other hand, have 3 separate sources of risk: (1) Systematic exposure to economic growth, (2) Business risk associated with the company, and (3) Leverage risk. While the first two are generally considered the prime reasons for equity risk, the third is not. But equities are typically leveraged investments even though the buyer of equities does not have to use leverage to participate. The average debt/equity ratio of the S&P 500 is about 2:1. That is, the companies typically borrow money in order to finance growth. Credit, as we know, is the engine of growth in a capitalist system. This is one of the elements that give stocks, in theory, a very long duration.

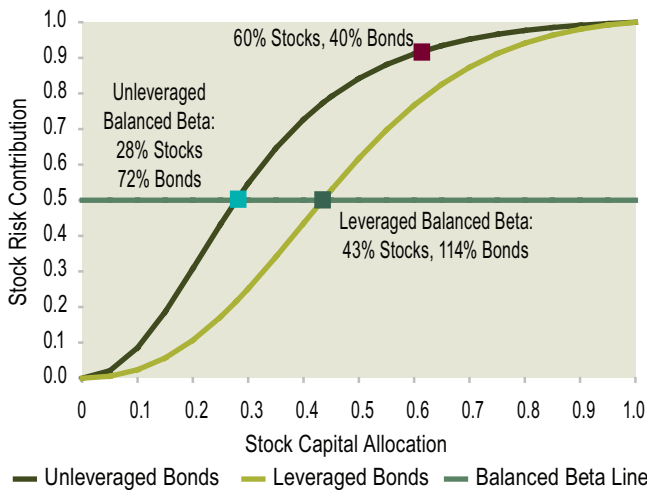
Sovereign bonds, on the other hand, are not leveraged, and have a short duration relative to stocks. So, one way to even the playing field between stocks and bonds is to create a synthetic long duration zero coupon bond in the futures market. If we buy more face value in bonds in the futures market than we have in cash, we are inherently “leveraging” bonds to increase duration. Note that this type of leverage does not involve borrowing bonds or cash and the types of risk associated with that type of leverage. Instead this is a form of synthetic leverage.

Luckily, the leverage needed to balance stock and bond risk is not that great. In general a leverage factor of 2:1 is all that’s needed in a “balanced” portfolio with total risk of 9% to 10%. This is similar to the debt/equity ratio passively assumed by investors in stocks. The risk of “blowing up” is relatively small since at 2:1 sovereign bond prices would have to fall by 50% in order for an investor to lose their investment. A sovereign bond collapse of that magnitude would amount to a developed market becoming a third world country. While this can happen, it is usually the result of losing a war rather than an explicit economic risk.

Figure 4 shows the point where we can balance the return and risk of a portfolio consisting of S&P500 and US 10 year T-Notes leveraged 2:1.

**FIGURE 4: ACHIEVING BALANCED BETA**

*Stock Capital vs. Risk Allocation in a Stock/Bond Portfolio*

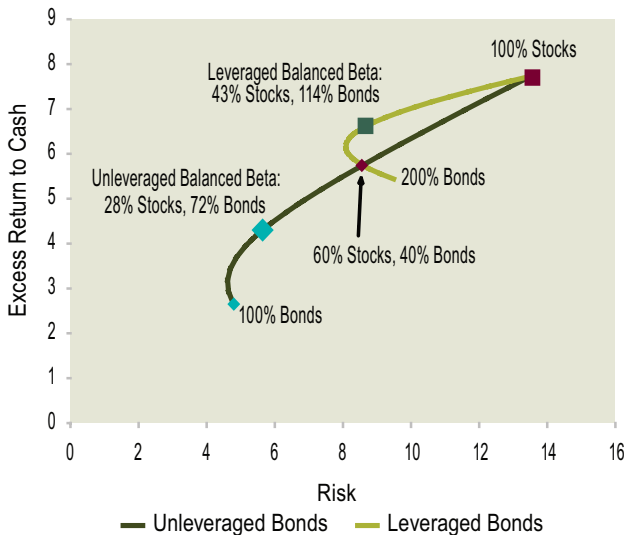


Source: First Quadrant, L.P.

We can now achieve balanced risk between stocks and bonds through a portfolio of 43% stocks and 114% bonds (Of course, we can also think of this mix as 43% stocks and 57% 14-year duration zero coupon bonds). The return/risk characteristics of such a portfolio change dramatically as well:

**FIGURE 5: BALANCED BETA WITH LEVERAGED BONDS**

*Diversifies Risk, Increases Expected Return*

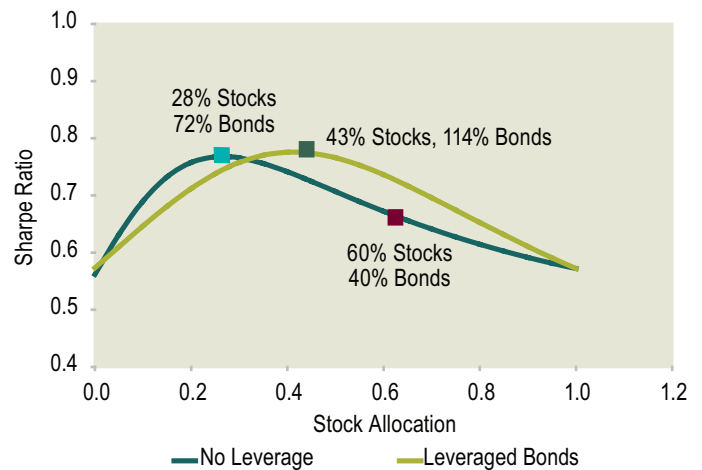


Source: First Quadrant, L.P.

The new portfolio has a similar total risk to the 60/40, but it actually has a higher expected return using the risk and returns from January 1986 – October 2008. It also has the same Sharpe Ratio as the 28/72 mix with unleveraged bonds both of which dominate the 60/40 portfolio. It is worth noting that the risk balanced portfolio is close to the optimal portfolio from a Sharpe Ratio standpoint. That is, the risk balanced portfolio is also a more mean/variance efficient portfolio than the 60/40. So balancing risk not only further diversifies the risk of the portfolio, but actually can increase the expected return at the same level of risk as a “balanced portfolio” that ignores the risk budgeting dimension. If we go to longer histories we can see the same pattern.

**FIGURE 6: BALANCED BETA AND PORTFOLIO EFFICIENCY**

*Higher Sharpe Ratio, Higher Return, Balanced Risk*



Source: First Quadrant, L.P.

From this simple example we can see the powerful impact that leveraging treasury bonds has upon our ability to structure the risk of a portfolio. Modest leverage, in this case, can actually reduce the risk of the total portfolio by balancing the risk exposure between the asset classes. Rather than having a 91% risk exposure to stocks as we do in the 60/40 case, we can change the risk exposure to a more balanced 50% while at the same time maintaining the same risk profile as a traditional 60/40 and increasing the long term expected return.

## Balancing Risk in a Global Multi-Asset Portfolio

For a long-term investor, a simple portfolio of US stocks and bonds is inadequate. As we discussed in “Does Your Portfolio Have ‘Bad Breadth’” an essential beta portfolio would have the goals of:

1. Participating in long run global economic growth,
2. Diversifying against general market declines to preserve capital, and
3. Hedging against inflationary and deflationary periods.

In order to achieve these goals there are three essential asset classes:

1. Stocks for Growth
  - Developed Market Equities
  - Small Cap Equities
  - Emerging Market Equities
  - REITS
2. Sovereign Bonds For Diversification And Deflation Hedging
  - Developed Market Long Duration Zero Coupon Bonds
  - Synthetically Created Using Futures
3. Real Assets to Hedge Against Inflation
  - Diversified Commodities
  - Treasury Inflation Protected Securities (TIPS)

The Portfolio Process Follows These Steps:

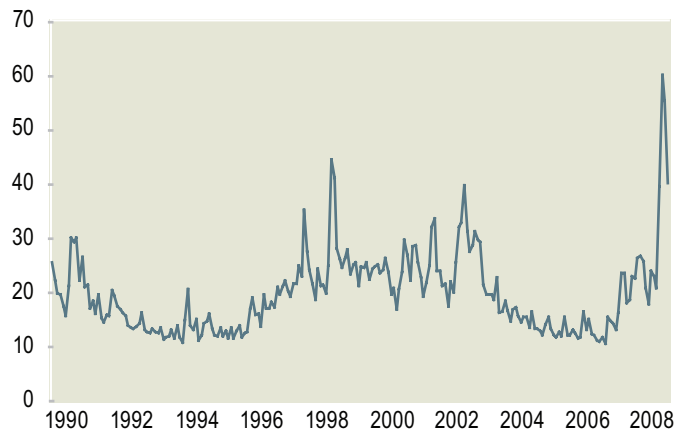
1. Establish Total Portfolio Risk Target
2. Balance Risk Across Segments Within Each Asset Class
3. Balance Risk Across Asset Classes To Conform With (1)

## Adapting to Changing Risk Environments

Typical risk budgeting assumes that risk is fairly stable over time and is measured by the standard deviation of returns and correlations among asset classes. Unfortunately, both of these measures can change for significant periods of time. For example, Figure 7 shows the VIX index of implied volatilities for S&P 500 options from January 1990 – December 2008. We can clearly see periods of higher and lower than average volatility, with the average at about 20. Many may remember that as recently as 2006 many investors were convinced that “globalization” had structurally changed the stock market, making it more efficient. This meant that volatility would be permanently below average. As in 1995 this turned out to be an illusion

that was shattered in the bear market that began in 2007 just as the earlier period of low volatility ended in 1997 with the Emerging Market crisis, and then the Russian Financial Crisis of 1998. Periods of economic crisis and uncertainty are as regular a part of the business cycle as the more stable periods. Realized volatility shows a similar pattern though it is based upon trailing returns rather than expectations, as is implied volatility.

**FIGURE 7: CBOE VOLATILITY INDEX (VIX)**  
January 1990 – December 2008



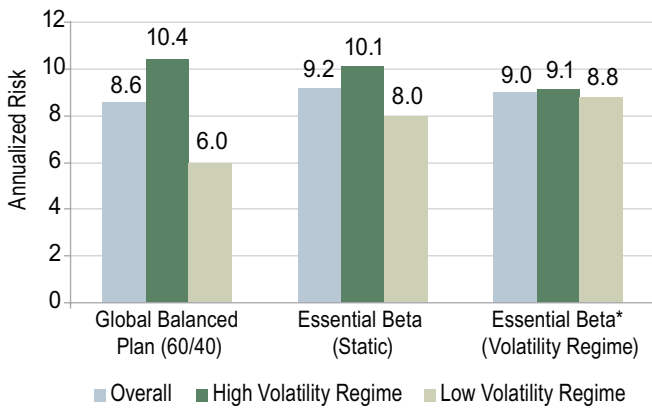
Source: Chicago Board Options Exchange; FQ

The fact that risk changes over the market cycle has profound implications for risk budgeting. A 60/40 global passive mix, for instance, can have a long term volatility of about 8.6%, but that can range from 6.0% in low volatility periods to 10.4% in high volatility regimes. So if we are truly going to balance risk, we need to take into account the long run dynamic nature of volatility to diversify the assets across time as well as across markets.

A simple, but effective approach is to divide the past into high and low volatility environments and estimate volatilities and correlations based upon this division. Volatility estimates derived in this way increase equities and commodities during periods of low volatility with an accompanying decrease in the allocation to bonds. During a high volatility period the reverse happens. Adding this procedure to the portfolio construction process greatly stabilizes the risk of the portfolio as can be seen from Figure 8 which compares a portfolio of 60% MSCI World stocks and 40% Citigroup World Government Bonds (WGBI) to an essential beta portfolio without regime shifts, and one that incorporates such shifts:

**FIGURE 8: RISK AND VOLATILITY REGIMES**

January 1988 – December 2008



Sources: First Quadrant, L.P.; Bloomberg

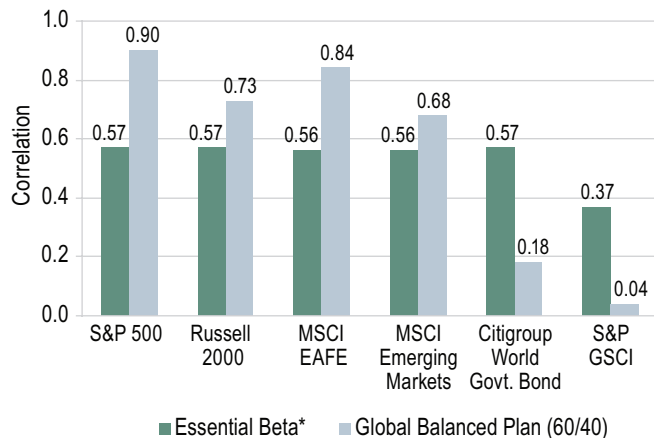
With the 60/40 portfolio we can see that while the overall risk is 8.6% the risk can vary from 10.4% during the high volatility regime and 6.0% in the low volatility regime. An essential beta portfolio without volatility regimes also has a difference though it is not nearly as pronounced. The far right bars show the impact of incorporating volatility regimes into the process. Risk across the regimes is essentially the same showing that this process compensates for the shifting volatility and correlations across markets.

Having shown that using volatility regimes are more desirable than a more fixed approach we will use this series to represent the essential beta portfolio from this point forward.

The question is does this approach truly balance risks better than conventional measures? The following graph shows correlations of the 60/40 balanced portfolio and essential beta with various market indices:

**FIGURE 9: ESSENTIAL MARKET EXPOSURE**

January 1988 – December 2008



Sources: First Quadrant, L.P.; Bloomberg

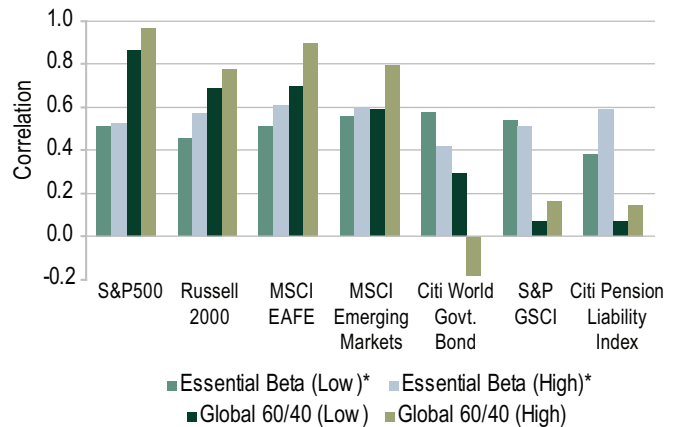
This graph shows correlations with the S&P 500, the Russell 2000, the MSCI EAFE, MSCI Emerging Markets Index, Citigroup World Government Bond Index, and the S&P GSCI. We can see that like the domestic version discussed earlier, the 60/40 global portfolio has significant correlation with the equity indices and a much smaller correlation with bonds and commodities. As a result, we would expect that the 60/40 would participate in long run economic growth, but not work well in economic declines, nor have much of inflation or deflation hedge working within it. The essential beta portfolio, on the other hand, has a more balanced correlation with all of the asset classes and shows the true diversification inherent in the portfolio.

### Extreme Events

As we have seen in 2007 and 2008, a high volatility environment has extreme events on both the upside and the downside. In addition, correlations and volatilities change which also must be investigated when looking at the effectiveness of a risk budgeting methodology. So first, we'll recast Figure 10 into high and low volatility regimes where a VIX greater than 20 is a high volatility regime, and 20 or below is a low volatility regime.

**FIGURE 10: ESSENTIAL MARKET EXPOSURE VOLATILITY REGIMES**

January 1995 – December 2008



Sources: First Quadrant, L.P.; Bloomberg

For the 60/40 correlations with equities goes up when volatility is high, and is also lower against bonds and commodities. For the essential beta portfolio correlations remain fairly stable. This graph begins on January 1995 so that we can include liabilities. Liabilities are represented by the Citigroup Pension Liability Index which is a fair representation of the change in the liability stream of most pension plans. We can see that the 60/40 has a low correlation with liabilities in both regimes, while the essential beta portfolio has a correlation of over 50% with liabilities during high volatility periods due to its long duration bond component.

\* Please see **Simulation Disclosures: Essential Beta - Simulated Performance** (Net of Fees) found at the end of this article for information concerning this simulation.



## Return and Risk

So far our discussion has centered on risk budgeting. The final question is, how does the portfolio perform? Does it deliver the returns necessary to justify its more complex structure? We have performed historical simulations of this process. The results are summarized below:

**TABLE 1: ESSENTIAL BETA SIMULATED PERFORMANCE\***  
*Excess Returns January 1988 – December 2008*

	Returns Excess of Cash		
	Global Balanced Plan (60/40)	Essential Beta (gross)	Essential Beta (net)
2008	-23.4%	-10.1%	-10.3%
2007	0.1%	6.0%	5.8%
2006	5.0%	-1.8%	-2.0%
2005	8.2%	15.0%	14.8%
2004	7.8%	18.5%	18.2%
2003	14.9%	16.8%	16.5%
2002	-13.4%	9.7%	9.4%
2001	-10.1%	-8.9%	-9.1%
2000	-8.7%	7.7%	7.4%
1999	11.2%	0.6%	0.3%
1998	12.1%	-1.9%	-2.2%
1997	12.2%	5.7%	5.4%
1996	8.1%	14.5%	14.2%
1995	13.2%	22.4%	22.0%
1994	-5.3%	-19.7%	-20.0%
1993	16.0%	27.5%	27.0%
1992	0.2%	3.2%	2.8%
1991	10.7%	15.1%	14.6%
1990	-18.4%	-12.1%	-12.4%
1989	9.5%	6.5%	6.1%
1988	12.3%	8.0%	7.5%
Annualized Excess Return	2.3%	5.2%	4.9%
Annualized Risk	8.6%	9.0%	9.0%
Sharpe Ratio	0.3	0.6	0.5

As we can see, based on our simulation, over the long-run the essential beta portfolio delivers significantly better excess returns than the 60/40 at about the same level of risk. At the same time it delivers balanced risk exposure and less dependence on stocks.

However, the 60/40 is not the essential beta portfolio's benchmark. There is roughly a 7.1% tracking error with the 60/40 and we can see that there are wide differences in performance every year. Also, it is clear from the composition of the portfolio that when stocks outperform bonds and commodities by a large margin, as they did during the tech bubble of 1997–1999, an essential beta portfolio could underperform the 60/40.

## Summary

In a previous article we showed that in some cases “breadth” decreases diversification. In this paper we have shown that balancing capital is not the same as balancing risk. Reallocating capital is not the same as diversification. However, we can engineer a solution if we let go of some of the preconceptions we have about the nature of risk. In particular, if we accept that modest leverage of a low-volatility asset is not overly “risky,” we can actually achieve true risk diversification. A global multi-asset portfolio constructed in this manner can have multiple sources of essential beta and achieve the investment goals of participating in long-run economic growth while protecting against market declines and the threat of inflation or deflation.

We can also see within this study the value of “Rethinking Beta.” In an essential beta portfolio, the components are re-combined to make something entirely different than the individual components. We are not merely rebalancing among asset classes to reduce asset class risk, but recombining the components, or betas, to develop a portfolio that is also diversified through time by taking into account the changing nature of risk. In this way an essential beta portfolio is truly diversified across markets and across time.



\* Please see **Simulation Disclosures: Essential Beta - Simulated Performance** (Net of Fees) found at the end of this article for information concerning this simulation.

## Essential Beta – Simulated Performance (Net of Fees)

Unless otherwise noted, performance figures do not reflect the deduction of investment advisory fees. These fees are described below. The returns shown will be reduced by the advisory fees and any other expenses the advisor may incur in the management of an investment advisory account. **Simulated performance is no guarantee of the future results in a live portfolio using the strategy. Potential for profit is accompanied by possibility of loss.** **General Disclosures:** The simulated performance used in this presentation may differ from live performance experienced using the strategy for the following reasons: • The simulation assumes that we adjust the risk and capital allocated to each sub-strategy on a monthly basis after the close on the last day of each month, whereas the live product may not adjust the allocations exactly at that time. • The simulation assumes that the strategy and sub-strategy guidelines are constant through the life of the portfolio, whereas, the guidelines for live portfolios may have changed over the life of each portfolio. • The simulation assumes fixed transaction costs whereas live portfolio transaction costs will be variable. • The simulation uses a synthetic long duration zero coupon bond for each bond country allocation. The cash return for the synthetic bond can vary by broker. • The simulation assumes all trading takes place once a month (on the last day of the month) whereas live portfolios may trade often during the month. • Hypothetical or simulated performance results have certain inherent limitations. Unlike an actual performance record, simulated results do not represent actual trading. Also, since the trades have not actually been executed, the results may have under or over compensated for the impact, if any, of certain market factors, such as lack of liquidity or positions need to be rounded based upon contract size when futures trades are being executed. Simulated trading programs in general are also subject to the fact that they are designed with the benefit of hindsight. No representation is being made that any account will or is likely to achieve profits or losses similar to those shown. Unless otherwise noted, performance returns for one year or longer are annualized. Performance returns for periods of less than one year are for the period reported. **Disclosures Specific to Simulation:** The Essential Beta simulation is constructed with the goal to diversify risk in a portfolio by strategically allocating risk to several sub-strategies/asset classes including, without limitation: Developed Market Equities; US Small Cap Equities; Emerging Market Equities; Real Estate Investment Trusts (“REITS”); Diversified Commodities; US Treasury Inflation-Protected Securities (“US TIPS”), and Long Duration Zero Coupon Synthetic Bonds (“Synthetic Treasuries”). The simulation assumes Synthetic Treasuries are created by using futures on various developed country sovereign bonds. The simulation additionally attempts to balance risk relative to country and sector weightings. The simulation targets overall portfolio risk allocations based on pre-determined indicators of market risk which may change over time. **Investment Management Fees:** All performance results presented include trading commissions. The FQ investment management asset-based fee schedule (assets managed in millions) for this strategy, which is negotiable, is as follows: \$0–\$50, 0.50%; \$50–\$250, 0.30%; and more than \$250, 0.15%. Asset-based fees are charged incrementally. For example, a \$200 million dollar portfolio will be charged .50% for the first \$50 million, 0.30% for the next \$150 million.

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