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Does Your Portfolio Have Bad Breadth?



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Global Macro

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In the last few years there has been much discussion about separating beta and alpha in portfolios. Beta is generally considered passive exposure to the markets, usually across asset classes. Beta is cheap and fairly easy to obtain, so most of the discussion is about alpha. However, while passive market exposure is easy and cheap, putting together a beta portfolio is far from straightforward. The financial literature is full of articles about asset allocation, optimisation and diversification. Yet as the bear market that began in 2007 has shown, textbook diversified portfolios may turn out to be less diversified than theory tells us. As we rethink the concept of beta, it's clear that we also need to rethink the concepts of diversification and 'breadth', which many unfortunately think of as synonyms.

In this article we will examine what markets, or betas, are essential for an investor to fully diversify a global portfolio while still achieving long-run return goals. We will also look at how breadth is often confused with diversification.

ESSENTIAL ASSET CLASSES

To begin with, we should return to first principles. Why should we have a portfolio of beta returns anyway? If, in theory, alternative investment strategies give returns, which are skewed to the upside, why do we need passive exposure to both up and down markets? The answer is economic growth. Fundamental to modern economics is the idea that economies continue to grow over the long term and equity markets passively grow with the economy, giving a built-in engine of growth. Important to our motivations is the fact that most investments are made to serve future consumption of one form or another, and that by investing in economic growth we are more likely to achieve the ultimate goal of investment. There is volatility around that outcome, but we can be assured that by definition, if the global economy grows a diversified basket of equities will grow with it.

Non-directional returns do not have this built-in passive growth component, and building absolute returns comparable to passive equity returns requires great skill, so the cost is high. In contrast market, or beta exposure to equities, gives us participation in the growth of the global economy at a very low cost if we use

index funds. Economies also decline, and when they do, our equity investments will also decline. In addition, equities are priced based upon expectations so there is a good deal of volatility around those returns in the near term. Because of this, we need a cushion for volatility and declining markets. Historically this has meant sovereign bonds in the portfolio. In addition, we have the threat of inflation eroding our earnings, or deflation eroding the value of our assets. Bonds are also a good deflation hedge but decline during inflationary periods. Real assets like commodities and TIPS are good inflation hedges as are equities, although equities tend to be a better inflation hedge long-term and tend to have initial or short-term responses to inflation in the opposite direction.

So a global beta portfolio has the goal of:

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

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

1. Equities for growth.
2. Bonds for diversification and deflation hedging.
3. Real assets for inflation hedging.

Within these three essential asset classes there are several sub-classes which investors can also choose to include in their beta portfolio. It is often assumed that the more asset classes or 'breadth' we have the more diversification we have in the portfolio. This may, or may not be true.

DIVERSIFICATION AND 'BAD BREADTH'

Harry Markowitz showed us that diversification depends upon the volatility and correlation of the assets under consideration. It is true that the more highly correlated a group of investments are, the more assets you need to achieve diversification. When considering equities, a large portfolio of assets will generally be better diversified than a more concentrated portfolio. But that, of course depends upon the contents of the portfolio. The Dow Jones Industrial Average is diversified enough to be a broad market benchmark even though it only has 30 stocks in it. The NASDAQ 100, on the other hand is considered a specialty benchmark even though it has over three times the 'breadth' because its contents are more highly correlated with one another.

So, let us once again go back to first principles. What is the purpose of diversification? Typically assets are considered good diversifying assets if they reduce the volatility of the overall portfolio, including the downside risk, while maintaining a specific return objective. If we look within an asset class, increasing the number of investments will indeed increase diversification but can, in fact, over diversify a portfolio. A large number of equity managers combined into one fund will eventually replicate a stock market index at a higher cost than an index fund.

There has also been a tendency in asset allocation funds to increase the 'breadth' of the fund by increasing the number of 'asset classes.' This "diversification for diversification's sake" usually implies that the more assets you have the more 'diversified' you are. To emphasise this point, a pie chart with multi-coloured slices is often used with so many small slices that an investor has a hard time reading what they represent.

Unfortunately, increasing 'breadth' by increasing the number of pie slices may reduce the diversification of the total portfolio in many cases since there may be increased correlations across asset classes. In this way 'breadth' can be bad for a portfolio. The following tables illustrate how increasing breadth can decrease diversification. Table 1 shows correlations of various indices and the S&P 500 from January 1988–October 2008:

Table 1. Correlation with the S&P 500 (1/88–10/08)

	Overall
Russell 2000	0.7
MSCI EAFE	0.8
MSCI Emerging Market Stocks	0.7

Suppose we are starting with a portfolio that is 60 per cent S&P 500 and 40 per cent 10-year US T-notes. For the moment we will ignore increasing return and focus strictly on risk. We can see that adding the Russell 2000, MSCI EAFE and MSCI emerging markets stocks to the 60 per cent equity exposure will diversify the equity component of the portfolio since their correlations with the S&P 500 are less than 1.00.

The next table shows correlations between the US 10-year T-note and the Lehman AAA Bond Index, the Lehman BBB Bond Index, and the Global Financial Data (GFD) Emerging Market Bond Index:

Table 2. Correlation with US 10-year T-notes (1/88–10/08)

	Overall
AAA Corp	0.8
BBB Corp	0.8
EMG Market Bonds	0.1

Data Sources: Datastream, Global Financial Data

Again, we can see that adding investment grade credit, junk bonds and emerging market bonds would all further diversify a bond portfolio that is strictly US treasuries.

But what happens when we put stocks and bonds together?

Table 3. Correlation between bond portfolios and the S&P 500 (1/88–10/08)

	Overall
US 10-year T-note	-0.1
AAA Corp	0.0
BBB Corp	0.2
EMG Mk Bnds	0.5

Data Sources: Datastream, Global Financial Data

Emerging market bonds, which greatly diversify the bond portfolio, are significantly correlated with the US stock market. So allocating a portion of our US bond allocation to emerging market bonds actually increases our exposure to stocks and reduces the diversifying effect of the bond portfolio as a whole. This is further magnified when we look at periods when the equity market is down. As we will see below, emerging market bonds become even more highly correlated with equities during down turns as do AAA and BBB bonds.

So in selecting the essential markets for a beta portfolio we need to look at their impact on the total portfolio and not just their diversifying effect within their market sector. This is particularly true of bonds whose primary function is diversification during downturns.

ESSENTIAL EQUITIES

For equities, the decision is fairly straightforward. The purpose of the equity portfolio is to participate in global economic growth. So the more sub-sectors, the better it is for diversification. While the equity markets are fairly highly correlated, the goal is to participate in as many sectors as possible. So passive indexing by country assures participation in industry and style equities at their market weights. Small cap adds participation in the entrepreneurial sector of the economy, and emerging markets add small cap on a regional basis. Real estate is also equity with more income. All of these elements are important parts of the global economy and are necessary to participate in global economic growth.

However, the diversification benefit of investing in different sectors of the equity market does change over the market cycle. In particular, equity markets tend to be more highly correlated in down markets than in up markets so the implied diversification benefits of correlations calculated over the full market cycle are misleading. We will return to this point later.

ESSENTIAL BONDS

Bonds are a trickier component. Bonds exist to hedge the portfolio against economic declines as well as hedge against deflation. Bonds also produce income, but for an investor with a long investment horizon, income is a small consideration. While sovereign bonds have a low or even negative correlation with stocks during market declines, they have the undesirable characteristic of having low volatility and low returns in comparison to stocks which, in theory, have a very long duration. So in order to compensate, bond managers have, over time, added different categories of bonds to the portfolio to enhance returns and increase risk. These investments include agency and mortgage bonds, investment grade (AAA) corporate bonds, high yield (junk) corporate bonds, and emerging market bonds. However, each of these categories carries their own idiosyncratic risks. Agencies and mortgages carry risk of the housing sector and lending. Corporate bonds and junk bonds carry the default risk of their underlying corporations and so have a tie to the equity markets. Emerging market bonds, likewise, carry significant default risk of their countries since small countries defaulting on their debt is fairly common. In fact, each of these categories carries elements of the sovereign bond market, which acts as a base for interest rates, and a risk premium that has close ties to the equity market. So during good times these bonds enhance bond portfolio returns without a significant increase in risk. But when the equity market is under stress these bonds underperform sovereign bonds and dilute the hedging effect of their treasury component.

Volatility regimes

One way of looking at diversification is to check correlations over a long time period. However, that assumes that correlations are stable over time, and we have seen that under periods of stress, correlations and volatilities can change significantly. To find the essential bonds needed for investment we can look at such periods of stress.

Table 4. High volatility regime – correlations with the S&P 500 monthly returns (1/88–10/08)

	Overall	Hi Vol	SP500 < -6%	SP500 > +6%
Russell 2000	0.72	0.72	0.69	-0.48
MSCI EAFE	0.79	0.83	0.76	0.26
MSCI Emg Mkt Stks	0.67	0.72	0.87	0.02
US 10-yr T-note	-0.10	-0.25	-0.61	-0.07
AAA Corp	0.05	-0.01	-0.10	0.01
BBB Corp	0.23	0.16	0.25	-0.30
GFD Emg Mkt Bnds	0.47	0.51	0.87	-0.25
Goldman Sachs Commodity Index	0.00	0.00	0.28	-0.17

Data Sources: Datastream, Global Financial Data

For this study we will divide the market into high and low volatility regimes. The regimes are defined by the VIX, which is the implied volatility of a basket of options on the S&P 500. The VIX is an instantaneous measure of risk since it falls out of the Black-Scholes option pricing formula. The median and mean of the VIX since 1986 has been 20 per cent so we will say that a VIX of 20 per cent indicates a high volatility regime while a VIX of below 20 per cent is the low volatility regime. From January 1988 to October 2008 there have been 87 months, which can be classified as high volatility and 80 months as low volatility, so the sample is almost evenly split. During this period, an S&P 500 return of +/-6 per cent is approximately a two-standard deviation event, so we can consider that a measure of market stress. The following table shows correlations of various indices and bonds with the S&P 500 during these periods:

Overall correlations are in Column 2 and were already shown in Tables 1 and 3. Column 3 shows the correlations during the high volatility regime. Column 4 shows monthly correlations when the S&P 500 returned less than -6 per cent during the high volatility regime. Column 5 shows when the S&P 500 had monthly returns greater than +6 per cent in the same regime.

For the equities we note that correlation is high and increases for emerging market stocks during extreme market downturns. During extreme recoveries (and the high volatility regime has plenty of those) correlations actually reduce or even become negative. So for equities it appears that diversification works mostly on the upside in the high volatility regime and does little for the downside.

For bonds the prime diversifier with stocks is the 10-year treasury, which has an overall negative correlation with stocks during the high volatility periods and is even more negative during the downturns. AAAs have a smaller negative correlation. BBBs and emerging markets bonds both have significantly positive correlations during the downturns, particularly emerging markets bonds, and significant negative correlations when equities rebound. So adding these bond groups to the portfolio instead of holding treasuries would significantly reduce the diversifying effects of holding bonds during downturns. Emerging markets bonds, in fact, have the same correlation as emerging markets stocks during the downturn. In addition, junk bonds and emerging markets bonds appear to add diversification mostly on the upside when we don't need it. Treasuries, on the other hand have a high negative correlation in downturns and a small negative on upturns. So they protect against declines but do not hurt during upturns.

So, for essential bond exposure, adding non-sovereign bonds reduces the diversifying effects of the total bond holdings to the portfolio as a whole. However, using sovereign bonds alone results in the same problem we discussed earlier. Sovereign bonds have low volatility and low returns. The solution would be to use a long duration zero coupon bond, but STRIPS are only available in the US and they have limited liquidity for our purposes. Luckily, zero coupon sovereign bonds are easy to create synthetically using futures through leverage. Leveraging bond futures is easy to do in a risk controlled way. We can approximately say that leveraging a sovereign bond future 2:1 doubles its effective

duration. For example, currently a 10-year T-note future leveraged 2:1 has a duration of about 14 years. Liability directed investment (LDI) uses a similar technique to match bonds with liabilities. Leveraging sovereign bonds increases their return/risk characteristics so that they are comparable to stocks, but also preserves all the diversification effects that we saw before. So using synthetic zero coupon sovereign bonds allows us to diversify the risk of 'an essential beta portfolio' without adding credit risk or other idiosyncratic risk to the mix. Leverage, in this case, makes the portfolio less risky. In addition we are leveraging a low volatility asset so a 10-year T-note future leveraged 2:1 is still less volatile than the S&P 500. Those who remember Long Term Capital Management probably remember that LTCM leveraged their bonds 40:1 creating a synthetic 280-year duration zero coupon bond. That was risky, but a 14-year duration zero coupon bond would only 'blow up' if the US government blows up.

The result is a diversifying asset, which has great liquidity and modest risk. This would clearly be an essential market.

REAL ASSETS

Inflation can be a real threat to asset values. Bonds and some equities do poorly during periods of rising inflation. So inflation hedging is considered another 'essential' market exposure. We can obtain inflation hedging from two sources. The first is Treasury Inflation Protected Securities (TIPS). The second is from physical commodities. However, we have to be somewhat careful. As we saw in Table 4, the Goldman Sachs Commodity Index (GSCI) has a positive correlation with stocks during extreme downturns. TIPS can also carry additional risk in such environments. However, the inflation hedging benefits of commodities and TIPS overcome these objections and make them a part of 'an essential beta portfolio'.

A PORTFOLIO OF ESSENTIAL BETAS

If we look at the investment goals of a portfolio of essential betas we can see that it will consist of the following assets:

1. Stocks for growth
 - a. Developed market equities
 - b. Small cap equities
 - c. Emerging market equities
 - d. REITS
2. Sovereign bonds for diversification and deflation hedging
 - a. Long duration zero coupon bonds
 - b. Synthetically created using futures
3. Real assets for inflation hedging
 - a. Diversified commodities
 - b. TIPS

While these are the assets for essential market exposure, we have not covered how we would construct such a portfolio in order to balance risk among the asset classes and adapt to changing volatility conditions. ●