Bonds: Why Bother?

Investors may have some misconceptions about fixed income

By Robert Arnott

For four decades, from time to time, we hear this question: Why bother with bonds at all? Bond skeptics generally point out that stocks have beaten bonds by 5 percentage points a year for many decades, and that stock returns mean-revert, so that the true long-term investor enjoys that higher return with little additional risks in 20-year and longer annualized returns.

Recent events provide a powerful reminder that the risk premium is unreliable and that mean reversion cuts both ways; indeed, those 5 percent excess returns, earned in the auspicious circumstances of rising price-to-earnings ratios and rising bond yields, are a fast-fading memory, to which too many investors cling, in the face of starkly contradictory evidence. Most observers, whether bond skeptics or advocates, would be shocked to learn that the 40-year excess return for stocks, relative to holding and rolling ordinary 20-year Treasury bonds, is not even zero.

Zero "risk premium"[1]? For 40 years? Who would have thought this possible?

Most investors use bonds as part of their investment tool kit for two reasons: They ostensibly provide diversification, and they reduce our risk. They're typically not used in our quest for lofty returns. Most investors expect their stock holdings to outpace their bonds over any reasonably long span of time. Let's consider these two core beliefs of modern investing: the reliability of stocks as the higher-return asset class and the efficacy of bonds in portfolio diversification and in risk reduction. On careful inspection, we find many misconceptions in these core views of modern finance.

Also, the bond indexes themselves are generally seen as efficient portfolios, much the same as the stock indexes. We'll consider whether this view is sensible by examining the efficiency of the bond indexes themselves, and speculate on what all of this means for the future of bond index funds and ETFs.

The Death Of The Risk Premium?

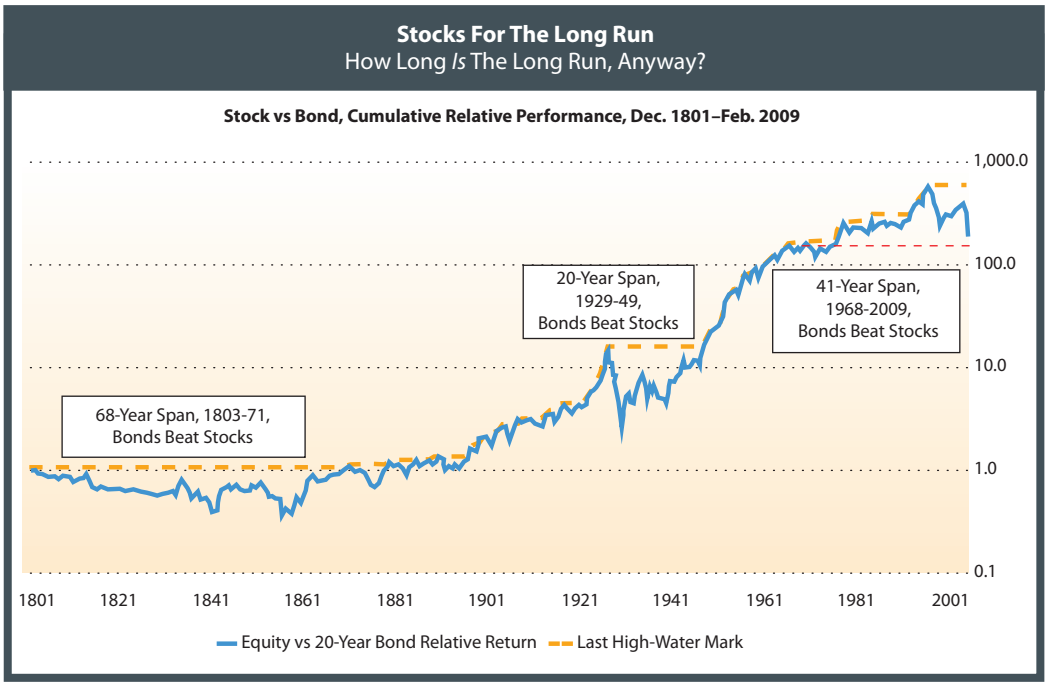
It's now well-known that stocks have produced negative returns for just over a decade. Real returns for capitalization-weighted U.S. indexes, like the S&P 500 Index, are now negative over any span starting 1997 or later. People fret about our "lost decade" for stocks, with good reason, but they underestimate the carnage. Even this simple real return analysis ignores our opportunity cost. Starting any time we choose from 1979 through 2008, the investor in 20-year Treasuries (consistently rolling to the nearest 20-year bond and reinvesting income) beats the S&P 500 investor. In fact, from the end of February 1969 through February 2009, despite the grim bond collapse of the 1970s, our 20-year bond investors win by a nose. We're now looking at a lost 40 years!

Where's our birthright … our 5 percent equity risk premium? Aren't we entitled to a "win" with stocks, by about 5 percent per year, as long as our time horizon is at least 10 or 20 years? In early 2000, Ron Ryan and I wrote a paper entitled "The Death of the Risk Premium,"[2] which was ultimately published in early 2001. It was greeted with some derision at the time, and some anger as the excess returns for stocks soon swung sharply negative. Now, it finally gets some respect, arguably a bit late …

It's hard to imagine that bonds could ever have outpaced stocks for 40 years, but there is precedent. Figure 1 shows the wealth of a stock investor, relative to a bond investor. From 1802 to February 2009, the line rises nearly 150-fold.[3] This doesn't mean that the stock investor profited 150-fold over the past 200 years. Stocks actually did far better than that, giving us about *4 million* times our money in 207 years. But bonds gave us 27,000 times our money over the same span. So, the investor holding a broad U.S. stock market portfolio was 150 times wealthier than an investor holding U.S. bonds over this 207-year span. So far, so good.

That 150-fold relative wealth works out to a 2.5-percentage-point-per-year advantage for the stock market investor, almost exactly matching the historical average ex ante expected risk premium that Peter Bernstein and I derived in 2002 in "What Risk Premium Is 'Normal'?" Those who expect a 5 percent risk premium from their stock market investments, relative to bonds, either haven't studied enough market history—a charitable interpretation—or have forgotten some basic arithmetic—a less charitable view.

Figure 1



Source: Standard & Poor's, Ibbotson Associates, Cowles Commission and Schwert

A 2.5 percentage point advantage over two centuries compounds mightily over time. But it's a thin enough differential that it gives us a heck of a ride.

- From 1803 to 1857,[4] stocks floundered, giving the equity investor one-third of the wealth of the bond holder; by 1871, that shortfall was finally recovered. Oh, by the way, there was a bit of a war—or three—in between. Forget relative wealth if you owned Confederate States of America stocks or bonds. Most observers would be shocked to learn that there was *ever* a 68-year span with no excess return for stocks over bonds.
- Stocks continued their bumpy ride, delivering impressive returns for investors, over and above the returns available in bonds, from 1857 until 1929. This 72-year span was long enough to lull new generations of investors into wondering "why bother with bonds?" Which brings us to 1929.
- The crash of 1929–32 reminded us, once again, that stocks can hurt us, especially if our starting point involves dividend yields of less than 3 percent and P/E ratios north of 20x. It took 20 years for the stock market investor to loft past the bond investor again, and to achieve new relative-wealth peaks.
- Then again, between 1932 and 2000, we experienced another 68-year span in which stocks beat bonds reasonably relentlessly, and we were again persuaded that, for the long-term investor, stocks are the preferred low-risk investment. Indeed, stocks were seen as so very low risk that we tolerated a 1 percent yield on stocks, at a time when bond yields were 6 percent and even TIPS yields were north of 4 percent.
- From the peak in 2000 to year-end 2008, the equity investor lost nearly three-fourths of his or her wealth, relative to the investor in long Treasuries.

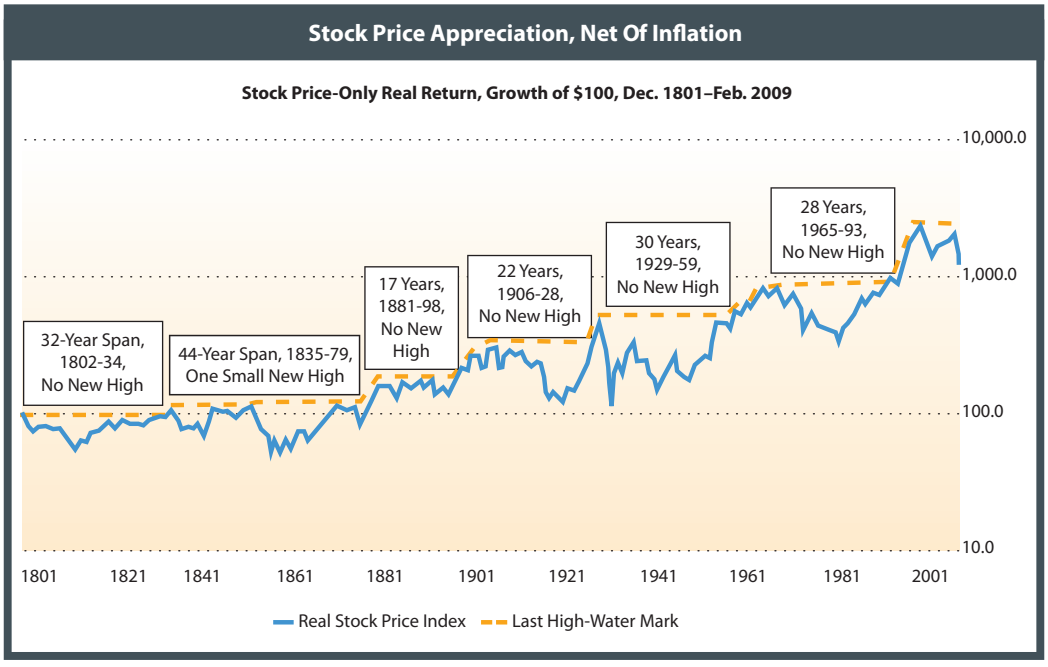
It's also striking to note that, even setting aside the opportunity cost of forgoing bond yields, share prices themselves, measured in real terms, are usually struggling to recover a past loss, rather than lofting to new highs. Figure 2 shows the price-only return for U.S. stocks, using S&P and Ibbotson from 1926 through February 2009, the Cowles Commission data from 1871–1925, and Schwert data[5] from 1802–1870. Out of the past 207 years, stocks have spent 173 years—more than 80 percent of the time—either faltering from old highs or clawing back to recover past losses. And that only includes the lengthy spans in which markets needed 15 years or more to reach a new high.

Most observers will probably think that it's been a long time since we last had this experience. Not true. In real, inflation-adjusted terms, the 1965 peak for the S&P 500 was not exceeded until 1993, a span of 28 years. That's 28 years in which—in real terms—we earned only our dividend yield … or less. This is sobering history for the legions who believe that, for stocks, dividends don't really matter.

If we choose to examine this from a truly bleak glass-half-empty perspective, we might even explore the longest spans between a market top and the very last time that price level is subsequently seen, typically in some deep bear market in the long-distant future. Of course, it's not entirely fair to look at returns from a major market peak to some future major market trough.[6] Still, it's an interesting comparison.

Consider 1802 again. As Figure 3 shows, the 1802 market peak was first exceeded in 1834—after a grim 32-year span encompassing a 12-year bear market, in which we lost almost half our wealth, and a 21-year bull market.[7] The peak of 1802 was not convincingly exceeded until 1877, a startling 75 years later. After 1877, we left the old share price levels of 1802 far behind; those levels were exceeded more than five-fold by the top of the 1929 bull market. By some measures, we might consider this span, 1857–1929, to have been a seven-decade bull market, albeit with some nasty interruptions along the way.

Figure 2



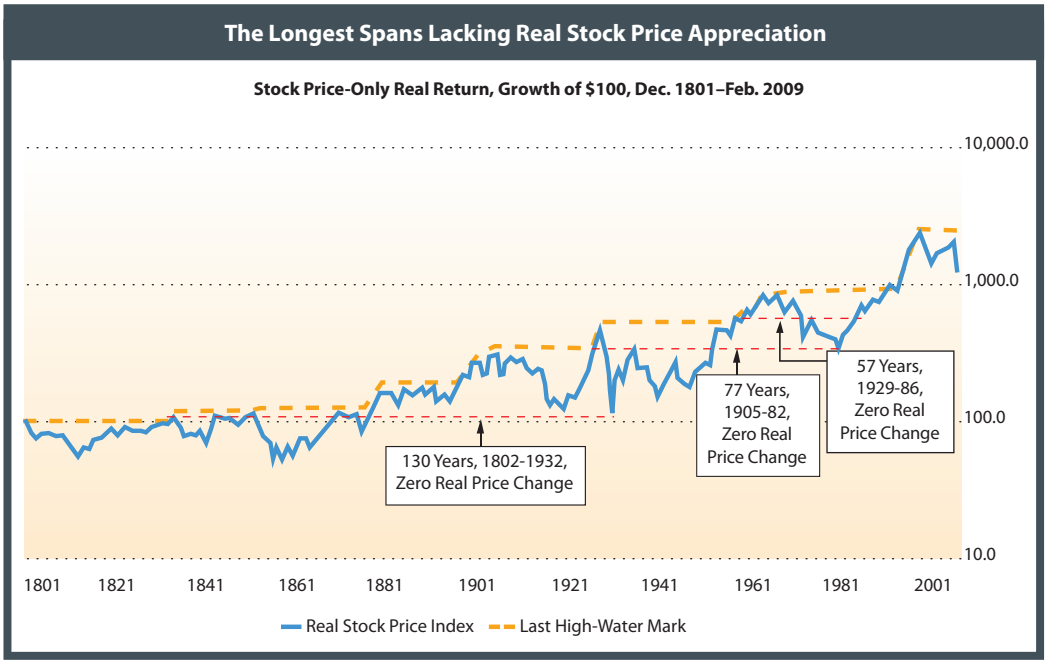
Source: Standard & Poor's, Ibbotson Associates, Cowles Commission and Schwert

The crash of 1929–32 then delivered a surprise that has gone unnoticed, as far as I'm aware, for the past 76 years. Note that the drop from 1929–32 was so severe that share prices, expressed in real terms, briefly dipped below 1802 levels. This means that our own U.S. stock market history exhibits a 130-year span in which real share prices were flat—albeit with many swings along the way—and so delivered only the dividend to the stock market investor. The 20th century gives us another such span. From the share price peak in 1905, we saw bull and bear

markets aplenty, but the bear market of 1982 (and the accompanying stagflation binge) saw share prices in real terms fall below the levels first reached in 1905—a 77-year span with no price appreciation in U.S. stocks.

Stocks for the long run? L-o-n-g run, indeed! A mere 20 percent additional drop from February 2009 levels would suffice to push the real level of the S&P 500 back down to 1968 levels. A decline of 45 percent from February 2009 levels—heaven forfend!—would actually bring us back to 1929 levels, in real inflation-adjusted terms.

Figure 3



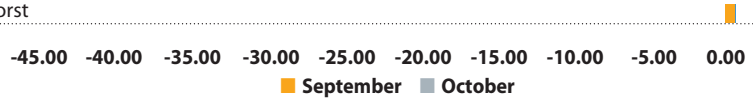
Source: Standard & Poor's, Ibbotson Associates, Cowles Commission and Schwert

My point in exploring this extended stock market history is to demonstrate that the widely accepted notion of a reliable 5 percent equity risk premium is a myth. Over this full 207-year span, the average stock market yield and the average bond yield have been nearly identical. The 2.5 percentage point difference in returns had two sources: Inflation averaging 1.5 percent trimmed the real returns available on bonds, while real earnings and dividend growth averaging 1.0 percent boosted the real returns on stocks. Today, the yields are again nearly identical. Does that mean that we should expect history's 2.5 percentage point excess return or the 5 percent premium that most investors expect? As Peter Bernstein and I suggested in 2002, it's hard to construct a scenario that delivers a 5 percent risk premium for stocks, relative to Treasury bonds, except from the troughs of a deep depression, unless we make some rather aggressive assumptions. This remains true to this day.

Figure 4

The Take-No-Prisoners Crash Of 2008
September/October 2008 Asset Class Returns

Asset Category	October Monthly Rank Since 1988	September / October 2008 Return	2-Month Return
MSCI Emerging Equity TR Index	2nd Worst		-41.02%
MSCI EAFE Equity TR Index	Worst		-31.68%
FTSE NAREIT All REITs TR Index	Worst		-30.46%
DJ-AIG Commodities TR Index	Worst		-30.41%
Russell 2000 Equity TR Index	Worst		-30.29%
S&P/TSX 60 TR Index	Worst		-27.69%
ML Convertible Bond Index	Worst		-26.78%
S&P 500 TR Index	Worst		-25.35%
Barclays US High Yield Index	Worst		-22.62%
JPMorgan Emerging Mrkt Bond Index	2nd Worst		-21.45%
Barclays Long Credit Index	Worst		-18.57%
Credit Suisse Leveraged Loans Index	Worst		-17.32%
JPMorgan Emerging Local Mrkts Index	Worst		-12.21%
Barclays US TIPS Index	Worst		-12.19%
Barclays Aggregate Bond Index	4th Worst		-3.67%
ML 1-3 Yr Government/Credit Index	29th Worst		-0.60%

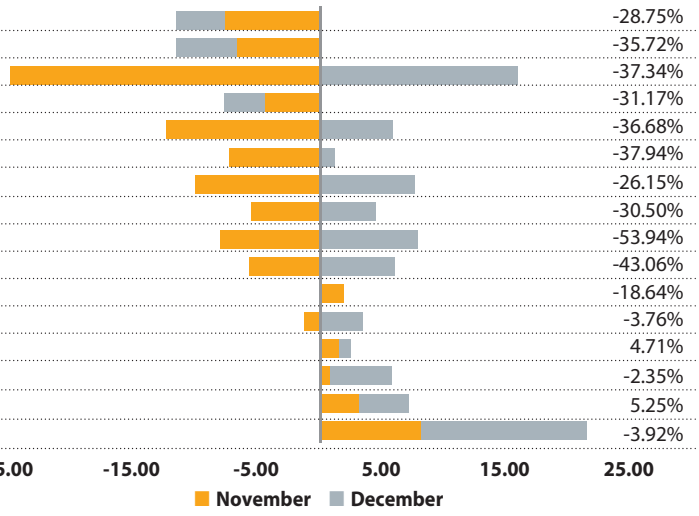


Source: Research Affiliates

Figure 5

The Aftermath Of The Crash, November/December 2008

Asset Category	December Monthly Rank Since 1988	2-Month Return	November / December 2008 Return	2008 Return
Credit Suisse Leveraged Loans Index	4th Worst	-11.37%		-28.75%
DJ-AIG Commodities TR Index	24th Worst	-11.16%		-35.72%
FTSE NAREIT All REITs TR Index	Best	-9.06%		-37.34%
S&P/TSX 60 TR Index	20th Worst	-7.78%		-31.17%
Russell 2000 Equity TR Index	38th Best	-6.71%		-36.68%
S&P 500 TR Index	118th Worst	-6.19%		-37.94%
Barclays US High Yield Index	2nd Best	-2.34%		-26.15%
ML Convertible Bond Index	14th Best	-1.11%		-30.50%
MSCI Emerging Equity TR Index	39th Best	-0.31%		-53.94%
MSCI EAFE Equity TR Index	27th Best	0.34%		-43.06%
JPMorgan Emerging Mrkt Bond Index	64th Worst	1.87%		-18.64%
JPMorgan Emerging Local Mrkts Index	10th Best	2.08%		-3.76%
ML 1-3 Yr Government/Credit Index	25th Best	2.44%		4.71%
Barclays US TIPS Index	Best	5.70%		-2.35%
Barclays Aggregate Bond Index	2nd Best	7.11%		5.25%
Barclays Long Credit Index	Best	21.38%		-3.92%



Source: Research Affiliates

Bonds And Diversification

If 2008–09 teaches us anything, it's the truth in the old adage: "The only thing that goes up in a market crash is correlation." Diversification is overrated, especially when we need it most. In our asset allocation work for North American clients, we model the performance of 16 different asset classes. In September 2008, how many of these asset classes gave us a positive return? Zero. How often had that happened before in our entire available history? Never. During that bleak month, the average loss for these 16 asset classes—including many asset classes that are historically safe, low-volatility markets—was 8 percent. Had that happened before? Yes; in August 1998, during the collapse of Long Term Capital Management (LTCM), the average loss was 9 percent. But, after the LTCM collapse, more than half of the damage was recovered in the very next month!

By contrast, in the aftermath of the September 2008 meltdown, we had the October crash. During October, how many of these asset classes gave us a positive return? None. Zero. Nada. How often had that happened before in our entire available history? Only once … in the previous month. How bad was the carnage in October 2008? The average loss was 14 percent. Had so large an average loss ever been seen before? No. As is evident in Figure 4, October 2008 was the worst single month in 20 years for three-fourths of the 16 asset classes shown. For most, it was the worst single month in the entire history at our disposal.

The aftermath of the September–October 2008 crash was, unsurprisingly, a period of picking through the carnage to find the surviving "walking wounded." As Figure 5 shows, the markets began a sorting-out process in November/December 2008. Some markets—the safe havens with little credit risk or liquidity risk—were deemed to have been hit too hard, and recovered handily. Others—the markets that are sensitive to default risk or economic weakness—were found wanting, suffering additional damage as a consequence of their vulnerability to a now-expected major recession. The range between the winners and the losers was over 3,000 basis points, nearly as wide as in the crash months of September/October, but more symmetrically around an average of roughly zero.

By the time the year had ended, bonds were both the best-performing assets and among the worst-performing assets. Consider Figure 6. The best-performing market on this list was long-duration stripped Treasuries—an asset class

Figure 6

2008 In Review, Selected Market Index Returns

Sampling of Returns	2008
20-30 Year Treasury STRIPS	56.5%
Barclays Capital US Aggregate	5.2%
1-Year Treasury Bills	3.3%
HFRI Composite Fund Of Funds Index	(20.7)%
HFRX Global Hedge Fund Index	(23.3)%
S&P 500	(37.0)%
MSCI EAFE	(43.1)%
S&P GSCI	(46.5)%
MSCI Asia Pacific ex Japan	(50.0)%
MSCI Emerging Markets	(54.5)%
HFRX Convertible Fixed Arbitrage Index	(58.4)%

Source: Research Affiliates

used in many LDI strategies—rising over 50 percent in that benighted year. The worst-performing asset is a shocker. It's an absolute-return strategy—represented as a way to protect assets in times of turbulence—that takes short positions in stocks and long positions in bonds! In a year when the bond aggregates rose 5 percent and stocks crashed 37 percent, this strategy leverages that winning spread. Investors used these convertible arbitrage hedge fund strategies as a source of absolute returns, a safe haven especially in a severe bear market, and got an absolute horror show.

Of course, it was unhelpful that the Convertible Bond Index went from 100 basis points below Treasury yields to (briefly) 2,400 basis points above Treasury yields. Nor was the brief SEC prohibition on short-selling over 1,000 different stocks helpful. Now, as the convertible arb hedge funds deal with their clients' mass exodus, the convertible bonds are looking for a new home; after all, even if these hedge funds are disappearing, their assets are not.

In 2008, the markets demonstrated that bond categories can be far more diverse and less correlated with one another than most investors previously believed. Indeed, in 2008, that was arguably even more true for bonds than for the broad stock market categories.

The Efficacy Of Bonds

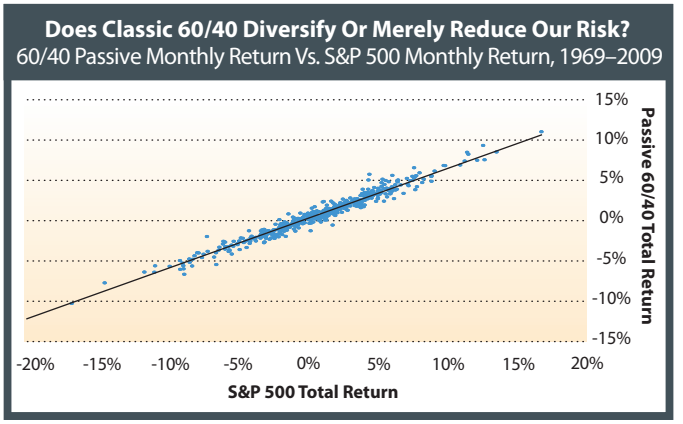
This brings us to the second core belief of most investors: the efficacy of bonds for diversification and risk reduction. One little-known fact is that the classic 60/40 balanced portfolio has roughly a 98 percent correlation with stocks. Figure 7 shows the monthly returns for a 60 percent S&P 500/40 percent BarCap Aggregate portfolio against the returns for the S&P 500 over the past 40 years. The 60/40 portfolio gave us 38 percent less risk than the S&P 500. A 38 percent allocation to T-bills would have served as well for risk reduction.

However, the 60/40 portfolio gave us an intercept (at zero stock market return) of 2.0 percent per annum, 1.4 percent better than a 38 percent T-bill allocation would have delivered. These data clearly show that—at least over the past 40 years—the BarCap Aggregate has been a far better way to reduce portfolio risk than cash. The slope of the yield curve is usually steep enough that the bonds do reward us well beyond their theoretical position on the CAPM market line.

Diversification is another matter. Let's assume that the goal of diversification is to reduce our risk by taking on new, uncorrelated risks in order to seek equitylike returns at bondlike risk—our industry's holy grail—rather than merely to invest some of our money in low-volatility markets.[8] Most would suggest that other risky assets should serve this purpose—*if* they offer an uncorrelated risk premium (e.g., if that risk premium is related to risk, not to beta). Conventional mainstream bonds do not serve us well in this regard, though many alternative bond categories do offer something closer to this definition of true diversification.

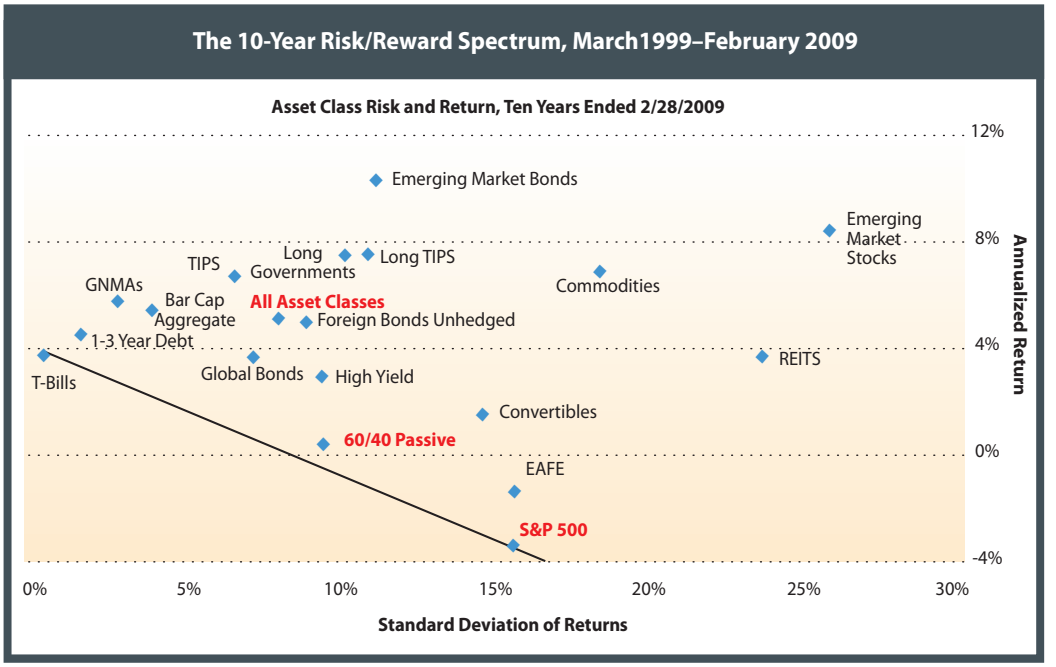
Consider Figure 8, which is a classic risk/reward chart spanning the 10 years from March 1999 through February 2009. Thankfully, nothing on this graph offers equitylike return, other than stocks themselves: Everything else has performed far better. Much as we just determined, our 60/40 investor did barely better than the linear capital market line suggests (although stocks dragged our 60/40 investor perilously near the zero-return line for the 10 years ended February 2009). But, the conventional bonds (represented by the BarCap Aggregate) bring our risk

Figure 7



Source: Standard & Poor's, Ibbotson Associates, Cowles Commission and Schwert

Figure 8



Source: Research Affiliates

down more because of their own low volatility rather than because of an uncorrelated risk premium.

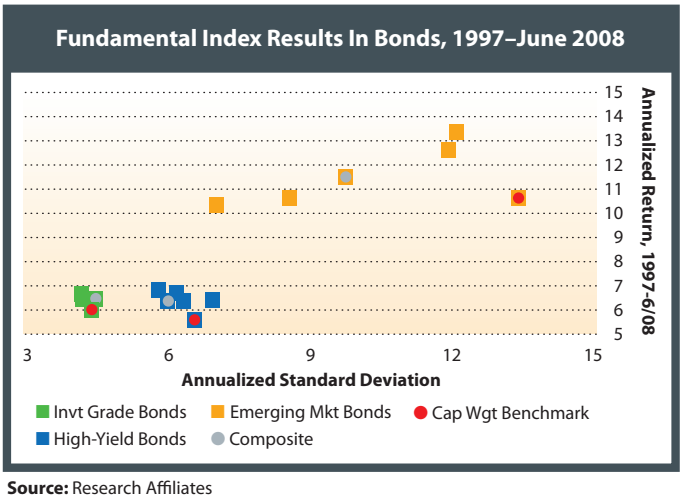
Over this decade, we had an array of asset classes at our disposal, many of which produced respectable returns; one even edged into double digits. A naive portfolio holding all of these asset classes equally would have delivered 5 percentage points more return, at a lower volatility, than our 60/40 investor. We can achieve true diversification by holding multiple risky markets with uncorrelated risk premia, and so lower our risk without simply relying on low-volatility markets. Achieving true diversification requires broadening our horizons well beyond conventional allocations to stocks resembling the S&P 500 and bonds resembling the BarCap Aggregate. Mainstream bonds alone don't get us there.

The Problem With Bond Indexes

Let's finally examine the mean-variance efficiency of the bond indexes. In 2001, Argentina's debt swelled beyond 20 percent of the major Emerging Markets Bond indexes. Mohamed El-Erian, then manager of Pimco's Emerging Markets Bond product suite, was repeatedly asked by other investors and observers, "How can you have no holdings in Argentina when it's over 20 percent of your benchmark index?" He famously replied, "*because* it's over 20 percent of the index and yet its fundamentals are rapidly deteriorating." Why buy bonds from issuers that have already borrowed more than they can hope to repay? And yet, the more debt that a company or country issues, the more that a market-value-weighted bond index will "own" of that company's debt. El-Erian's succinct observation is kindred to the oft-cited cliché that banks will only lend you money if you don't need it.[9] The bond investor's favorite investment ought to be with a borrower who can readily afford to repay the debt.

The thoughtful observer will notice that, in this regard, bond indexes are no different from any other indexes. Consider when Cisco was nearly 4 percent of the S&P 500 (with barely 20,000 employees worldwide) and Nortel exceeded 30 percent of the Canadian market—both at the peak of the Tech bubble in 2000; consider when GM and Ford together comprised 12 percent of the U.S. High-Yield Bond Index in 2006, and when Yukos was 17 percent of the Russian stock market in 2003. In each case, that hefty weight reflected (among other things) the fact that the price was—with the blessings of hindsight—far too high, masking troubles that became evident quickly enough.

Figure 9



Source: Research Affiliates

Let's start with the simple precept that we want to own more of any assets that we expect will deliver the highest returns. If that's so, then if we own twice as much of an asset that has recently doubled in price—as we do in our cap-weighted index portfolios—the asset logically must be more attractive after doubling than it was at half the price. Such is the "Alice in Wonderland" logic of conventional cap-weighted indexes.

One difference between stock and bond investors is that bond investors viscerally understand that if a creditor issues more debt, we don't necessarily want to own more of that issuer's debt. By contrast, many equity market investors are comfortable with the idea that our allocation to a stock doubles if the share price doubles; most bond investors are not. This is one of the reasons that bond index funds have not caught on nearly to the extent that stock index funds have.

Our research on the Fundamental Index® concept, as applied to bonds, underscores the widely held view in the bond community that we should not choose to own more of any security just because there's more of it available to us.[10] Figure 9 plots four different Fundamental Index portfolios (weighted on sales, profits, assets and dividends) in investment-grade bonds (green), high-yield bonds (blue) and emerging markets sovereign debt (yellow).[11] Most of these have lower volatility and higher return than the cap-weighted benchmark (marked with a red dot). And, the composite of the four indexes (marked with a grey dot) has better risk or reward characteristics than the average of the single-metric noncap indexes. Unsurprisingly, the opportunity to add value is greatest in emerging markets, substantial in high yield and less impressive in investment-grade debt, where the gap between fair value and price is likely to be small.

Investors clearly want index exposure to bond markets (bond index funds and ETFs), but are wary of the fact that conventional bond indexes will load up on the most aggressive borrowers' bonds. Index products can be constructed in ways that make the portfolio less vulnerable to the indexers' Achilles' heel: overrelying on the overvalued and vulnerable assets. The Fundamental Index concept is an elegant and simple way to do so. Equally weighted portfolios, minimum variance portfolios, maximum diversification portfolios and other structured products may do as well, or even perhaps better. But, the key is to get the price out of the weighting formula.

Conclusion

We manage assets in an equity-centric world. In the pages of the *Wall Street Journal*, *Financial Times* and other financial presses, we see endless comparisons of the best equity funds, value funds, growth funds, large-cap funds, mid-cap funds, small-cap funds, international equity funds, sector funds, international regional funds and so forth. Balanced funds get some grudging acknowledgment. Bond funds are

treated almost as the dull cousin, hidden in the attic.

This is no indictment of the financial press. They deliver the information that their readers demand, and bonds are—at first blush—less interesting. The same holds true for 401(k) offerings, which are overwhelmingly equity-centric. If 80–90 percent of the offerings provided to our employees are equity market strategies, is it any surprise that 80–90 percent of their assets are invested in stocks? And is it any surprise that they now feel angry and misled?

Many cherished myths drive our industry's equity-centric worldview. The events of 2008 are shining a spotlight, for professionals and retail investors alike, on the folly of relying on false dogma.

- For the long-term investor, stocks are supposed to add 5 percent per year over bonds. They don't. Indeed, for 10 years, 20 years, even 40 years, ordinary long-term Treasury bonds have outpaced the broad stock market.
- For the long-term investor, stock markets are supposed to give us steady gains, interrupted by periodic bear markets and occasional jolts like 1987 or 2008. The opposite—long periods of disappointment, interrupted by some wonderful gains—appears to be more accurate.
- For the long-term investor, mainstream bonds are supposed to reduce our risk and provide useful diversification, which can improve our long-term risk-adjusted returns. While they clearly reduce our risk, there are far more powerful ways to achieve true diversification—and many of them are out-of-mainstream segments of the bond market.
- Capitalization weighting is supposed to be the best way to construct a portfolio, whether for stocks or for bonds. The historical evidence is pretty solidly to the contrary.

As investors become increasingly aware that the conventional wisdom of modern investing is largely myth and urban legend, there will be growing demand for new ideas, and for more choices.

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Why are there so many equity market mutual funds, diving into the smallest niche of the world's stock markets, and so few specialty bond products, commodity products or other alternative market products? Today, investors are still reeling from the devastation of 2008, and the bleak equity results of this entire decade. They have already begun to notice that there were opportunities to earn gains, sometimes handsome gains, in a whole panoply of markets in the past decade—most of which are still difficult for the retail investor to access.

We're in the early stages of a revolution in the index community, now fast extending into the bond arena. In the pages of this special issue of the *Journal of Indexes*, we see several elements of that revolution. In the months and years ahead, we will see the division between active and passive management become ever more blurred. We will see the introduction of innovative new products. The spectrum of bond and alternative product for the retail investor will quickly expand. We will shake off our overreliance on dogma. And our industry will be healthier for it.

Endnotes

[1]I use the term "risk premium" advisedly. The "risk premium" is the forward-looking difference in *expected* returns. Differences in observed, realized returns should more properly be called the "excess return." Many people in the finance community use "risk premium" for both purposes, which creates a serious risk of confusion. I use the term here—wrongly, but deliberately—to draw attention to the fact that the much-vaunted 5 percent risk premium for stocks is at best unreliable and is probably little more than an urban legend of the finance community.

[2]Our paper, "The Death of the Risk Premium: Consequences of the 1990's," *Journal of Portfolio Management*, Spring 2001, was actually written in early 2000.

[3]For much of this section, we rely on the data that Peter Bernstein and I assembled for "What Risk Premium Is 'Normal'?" *Financial Analysts Journal*, March/April 2002. We are indebted to many sources for this data, ranging from Ibbotson Associates, the Cowles Commission, Bill Schwert of the University of Rochester and Robert Shiller of Yale. For the full roster of sources, see the *FAJ* paper.

[4]We used 20-year bonds whenever available. But, in the 1800s, the longest maturities tended to be 10 years. Also, in the 1840s, there was a brief span with no government debt, hence no government bonds. Here, we used railway and canal bonds, which were generally considered the safest bonds at the time, as these projects typically had the tacit support of the government. Think of them as the "Agency," and GSE bonds of the 19th century.

[5]Schwert, G. William, "Indexes of United States Stock Prices from 1802 to 1987." *Journal of Business*, vol. 63, no. 3 (July): 399–426.

[6]It's not unlike trying to forecast future stock and bond market returns on the basis of the experience of the current decade. The folly of this exercise is a mirror image of our industry's reliance on the splendid 1982–2000 experience to shape our return expectations, as far too many investors, actuaries, consultants and accountants actually did in 2000.

[7]While it's simple arithmetic, it bears notice that a 120 percent bull market recovers the damage of a 46 percent bear market with precious little room to spare, amounting to a few tens of basis points a year.

[8]Never mind the fact that a passive investment in 20-year Treasuries would have delivered exactly this over the past 40 years!

[9]This clearly was not true during the lending bubble of 2005–2007.

[10]See Arnott, Hsu, Li, Shepherd, "Valuation Indifferent Weighting for Bonds." *Journal Portfolio Management*, pending publication. Please note that there are U.S. and international patents pending on this work; we respectfully request that anyone wishing to explore this idea honor our intellectual property.

[11]Because measures like sales and profits are meaningless for sovereign debt, we use a different set of weighting metrics, still in keeping with the spirit of using measures that correspond to the size of the issuer. For countries, we define size using population, area, GDP and energy consumption.