MEKETA
INVESTMENT GROUP

High Yield: Strategic Allocation

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We argue that most institutional investors funds would benefit by holding an allocation to high yield bonds, and we discuss how much of a portfolio's assets should be so allocated since the level is highly valuation-dependent. Meketa Investment Group recommends that most diversified long-term pools consider allocating to high yield bonds, and if they do so, between five and ten percent of total assets in favorable markets, and maintaining a toehold investment even in adverse environments to permit rapid re-allocation should valuations shift.

We begin by providing background information on high yield bonds. We then proceed to discuss the three major risks inherent in high yield bonds: liquidity risk, default risk, and interest rate risk. In the following section, we analyze the return behavior of high yield bonds, including the characteristics of expected return, volatility, and correlation with other asset classes. We then proceed to evaluate the case for high yield bonds by comparing their use in a strategic and tactical context. The last section deals with issues an investor would face after deciding to invest in high yield bonds.

High yield bonds

High yield bonds, a.k.a. "below investment grade bonds" or "junk bonds," are bonds usually issued by corporations rated as less than investment grade by the three main credit-rating agencies (Moody's, Standard & Poor's, and Fitch). Because these companies are more likely to experience a default than companies rated as investment grade, investors demand a premium in the form of a higher yield—the difference between the high yield bond's yield and that of other bonds is called the spread, usually measured in relation to Treasuries. The high yield bond asset class covers a wide range of bonds, from just below investment grade issues to much riskier securities that have lost their credit ratings entirely.[1]

[1] Bond rating agencies provide letter grades of credit worthiness that indicate how likely it is that debt issues will be repaid. Ratings of BBB- (Standard & Poor's and Fitch) / Baa3 (Moody's) or better are considered investment grade, while ratings of BB+ (Standard & Poor's and Fitch) / Ba1 (Moody's) or worse are considered to be non investment grade: high yield and speculative. Please see Appendix C for examples of ratings definitions.

History of high yield bonds

From the late 1800s to the latter part of the 1900s, the high yield market consisted almost entirely of "fallen angels." "Fallen angels" is the term given to original issue investment grade debt that has suffered a decrease in credit rating to the point where it sells at below investment grade (high yield) debt—for example, if a formerly strong firm experienced a steep fall in revenues, which increased concerns about its ability

to service its debt. During the late 1970s, original issue high yield debt started to gain respectability among investors, borrowers, and underwriters. During the 1980s, the market overcame tremendous negative press related to the leveraged buy-out scandals involving Drexel Burnham Lambert and Michael Milken, as well as the alleged misrepresentation of some high yield marketers. Nevertheless, the high yield bond market still exists today as a significant portion of the domestic debt market.

Braddock Hickman did the first recognized study of high yield debt—which at the time focused on fallen angels—in 1958. His second book in a series of three, entitled *Corporate Bond Quality and Investor Experience*, attempted to map the history of the U.S. bond market from 1900 to 1943. His universe of bonds consisted of every existing or newly issued publicly traded bond from 1900 to 1943, a period that included some of the most volatile times in American financial market history.

The results of his study, shown in the following chart, were surprising at the time. He found that below investment grade bonds over-compensated investors for the additional default risk incurred. Below investment grade bonds on average returned 8.6% a year, compared to a 5.1% annual return for investment grade bonds.

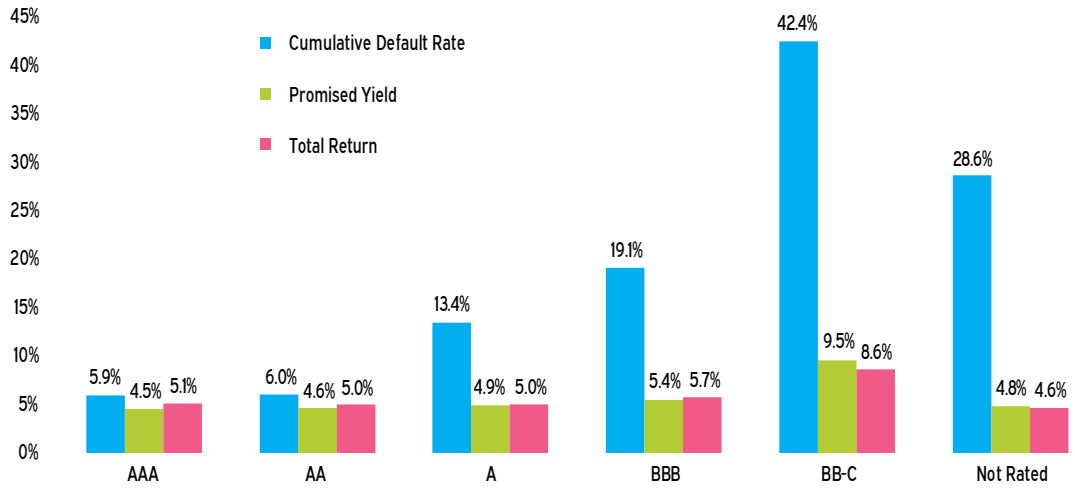

CHART 1
Bonds from 1900 to 1943

The reason for this outperformance was that the yields for lower grade bonds were consistently high enough to offset default rates, even through the depression years. As the default recovery rates for the period tended to hover around 40%, a bond purchased at par with an annual coupon of 10% could default after six years of debt service, resulting in no net investment loss.[2] Hickman's study showed investors that they typically receive adequate compensation for the risks inherent in the high yield market.

[2] This is only true in an absolute sense. There would still be a relative loss when compared to the possible investment in an investment grade bond. Given the choice between an investment grade bond with a coupon of 6% and a non-investment grade bond with a coupon of 10%, the lower grade bond would have to default after at least fifteen years of faithful service before the investor would be better off in a relative sense.

High yield bonds continued to post returns greater than investment grade bonds after the Hickman study. However, the structure of the market, its dynamics, and its

risks all changed considerably in the last quarter of the twentieth century. The most dramatic change was a surge of new issue high yield bonds. In 1977, Michael Milken started his career at Drexel Burnham Lambert, and over the next five years Milken and Drexel Burnham Lambert developed the high yield market we know today.

A combination of factors facilitated the growth of the high yield market. "Disintermediation" of financial markets—in this case, the ability of borrowers to secure funding directly from lenders, without having to go through a bank or another institutional middleman—became the driving force behind the development of the high yield market. In the past, companies that could not earn an investment grade rating could only qualify for short-term bank loans at high interest rates. The high yield market allowed these companies to avoid the banks and issue debt directly to investors who were willing to hold longer-term debt paying high coupons. Additionally, many companies found it profitable to use the high yield market to finance leveraged buy-outs (LBOs) or capital restructurings.

High yield bonds offer an easy financing opportunity for acquiring firms, small and large. Leveraged buy-outs were the targets of much of the negative press about high yield bonds, often for reasons related to the ensuing workforce reductions. Although responsible for much of the growth of the market, LBOs also had the effect of decreasing the financial stability of firms. Since firms undergoing an LBO take on a large amount of debt, the credit rating of existing debt falls, reducing the wealth of existing bondholders. The economic ramifications of LBOs were widely debated, yet the effects of LBOs on the high yield bond market and its investors drew little attention. These forces combined to expand the size of the high yield bond market at an incredible pace throughout the 1980s and beyond (see chart below).

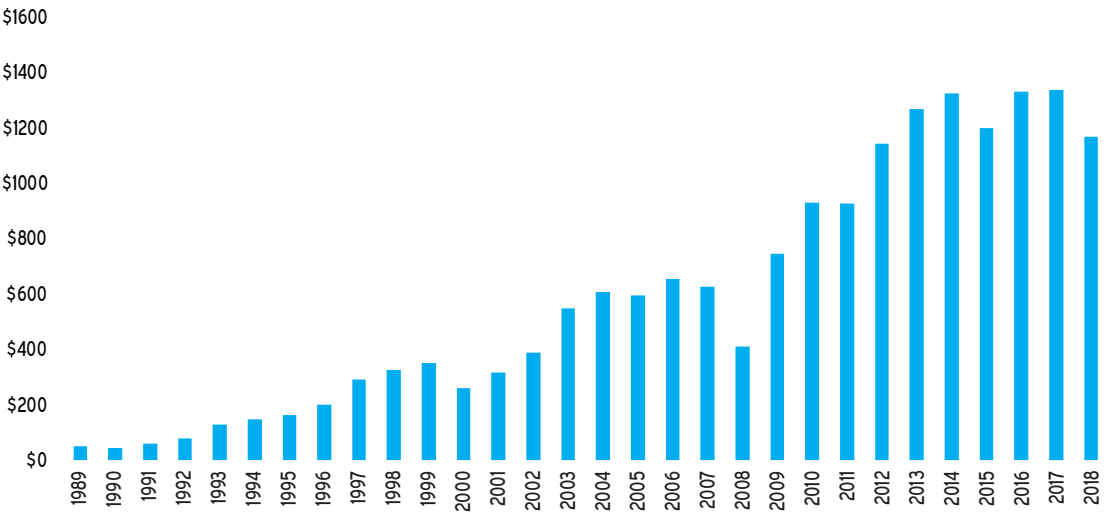

CHART 2
Size of High Yield Market ($ Billions)

Source: Barclays US High Yield Index

The structure of today's high yield market little resembles the one that Hickman studied. Today's high yield market has a high proportion of new issue debt, along with a wide spectrum of bond seniority and maturity. For example, Dell has issued a

BB rated bond with a yield of 6.58%, duration of 11.13, that pays a biannual coupon of 6.5%. A challenge for potential investors is to ascertain whether the long-term excess returns Hickman revealed in his study still pertain to today's high yield market.

Nature of risks in high yield bonds

Three types of risk affect investors in the high yield bond market: liquidity risk, interest rate risk, and default risk. Although these risks are present in the investment grade market, the nature of these risks and their interactions cause the high yield bond market to have distinct risk characteristics from the investment grade market.

Liquidity risk

Since active management of a high yield bond portfolio may require rapid turnover of a portfolio of bonds during certain times, it is necessary for the portfolio manager to trade within a liquid market. Liquidity risk is recognizable but difficult to quantify.

Liquidity risk continues to be a major concern since the advent of the high yield market, as increased regulation following the financial crisis has further decreased liquidity.

Recent events have served to remind investors about liquidity risk. In July 1997, the Thai baht was "de-linked" from the U.S. dollar. This move caused a crisis of confidence in emerging market countries, which tend to peg their currencies to the U.S. dollar. Many investors feared that the currency crisis in Southeast Asia would ultimately spread to the U.S. and take a toll on the domestic economy. Hence, U.S. equity markets, and the high yield market, tumbled in the summer of 1998. The lack of liquidity in the market caught off guard countless investors who thought they held relatively liquid debt; and consequently they suffered large losses on their high yield bond holdings. Rough analyses estimate that the lack of liquidity within the high yield market revealed during this crisis increased high yield spreads by an additional 100 basis points. This extra compensation may have been entirely warranted: in 2008, the high yield market also suffered extraordinary losses that were arguably due in part to the relative illiquidity of high yield bonds relative to Treasuries, which was to be expected.

As of October 2018, Morningstar reported on 680 distinct actively managed mutual funds that specialized in high yield bonds. These funds (including all share classes) represented an aggregate market value of $523 billion in high yield securities: triple the amount from seven years earlier. The mutual funds tracked by Morningstar only represent a fraction of the total investment in the high yield market, however this portion tends to trade actively (average turnover of 79%), ensuring liquidity. On the institutional side, eVestment Alliance, a database of institutional money managers, tracked 230 high yield bond products with an aggregate market value of $993 billion and a reported average turnover of 61%. Per the Barclays US High Yield index, the total high yield investable universe is roughly $1.2 trillion as of December 2018.

Liquidity risk continues to be a major concern since the advent of the high yield market, as increased regulation following the financial crisis has further decreased liquidity. In 2005, volume as a percent of current outstanding issues was roughly 180%; that had fallen to below 100% post financial crisis. As historical data on the market continues to accumulate, institutional investors will likely become more willing to devote assets to the high yield arena.

Default risk

The most dramatic and highly publicized risk in the high yield bond market is default risk. In a default, the bond issuer fails to make timely payments of interest or principal to the bondholder. The bondholder may eventually receive all, some, or none of the expected cash flows (including principal repayment). This risk defines the high yield market; it is what separates it from investment grade bonds. Because of default risk, the chance of extreme outcomes ("fat tailed" distributions) is elevated for high-yield bonds, and this increased likelihood results in a higher level of expected losses. The chart below demonstrates that high yield bonds' excess loss due to its fat tailed distribution[3] is greater than that of investment grade bonds, as one would expect, but it is also greater than that of domestic equities.

[3] Excess loss due to a fat-tail = the expected loss at 2.5% probability of distribution fitted to historical kurtosis, minus the expected loss at 2.5% probability of distribution for a 'normal' assumption. The 2.5 percentile is chosen as approximately at the two-sigma downside level.

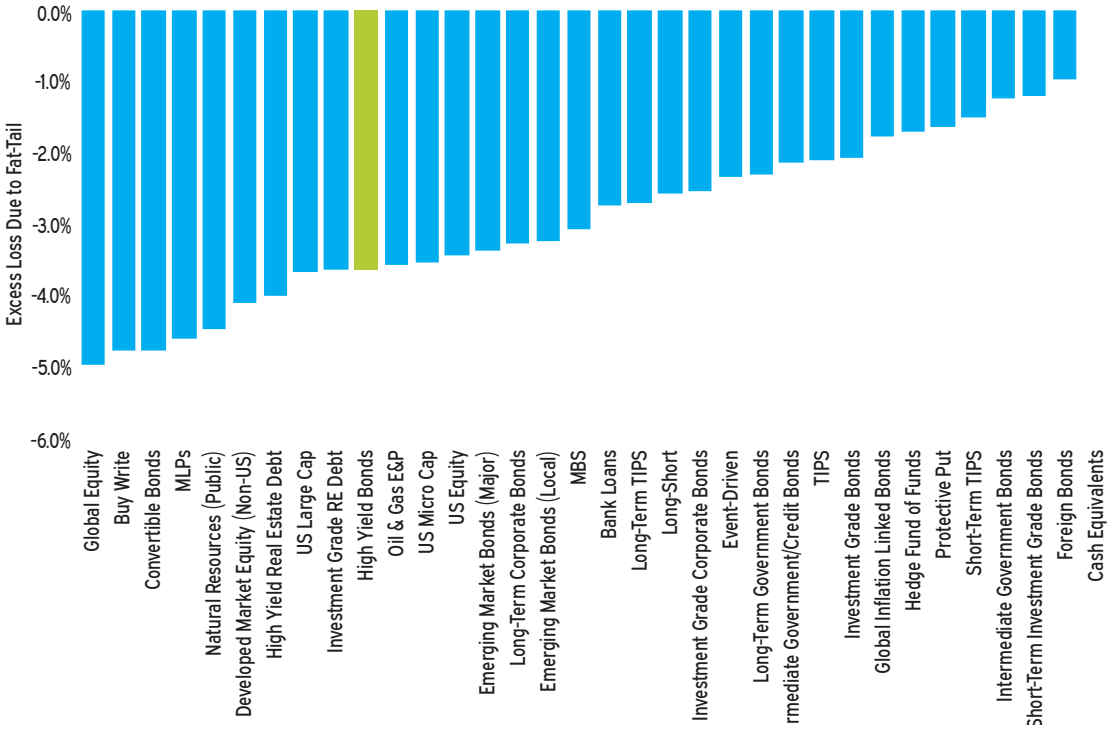

CHART 3

The chart below shows annual default rates from 1981 to 2017.

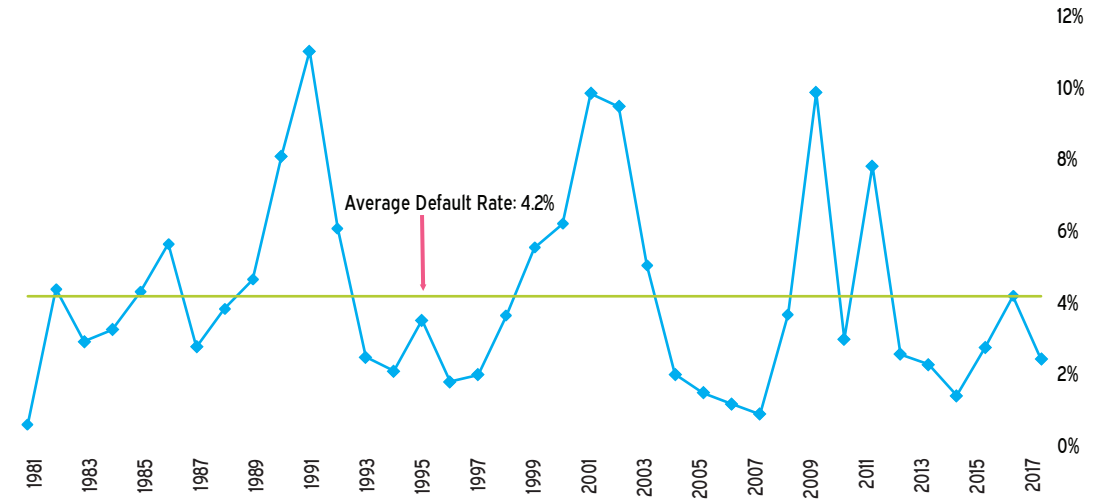

CHART 4

Default Rates: 1981 — 2017

Source: S&P Global Corporate Default Study

Note that default rates actually overstate the loss due to defaulting securities. Defaults are generally defined as missed payments; hence, some defaulted debt may be paid back if economic circumstances improve. In addition, debt that defaults due to bankruptcy tends to be recoverable at about 40¢ on the dollar, though this amount varies based on issue-specific and market conditions.[4] The calculation of actual loss to the investor from default is:

Amount lost = loss of principal + loss of coupon payments
= default rate x principal x (1 - recovery rate) + default rate x coupon payment

[4] Hickman found a recovery rate of 40% when studying defaulted securities in the first half of the century. This 40% recovery rate was constant throughout the 1980s and 1990s even as the market evolved. Moody's cites the average recovery rate as 47.9% from 1983-2016. Still, the annual recovery rate was just 21.5% for calendar year 2001. Depending on their position in the capital structure, long-term average recovery rates range from 62.6% for secured bank debt to 28.0% for junior subordinated debt from 1987-2017.

High yield expects that some companies default, but most do not, and a combination of investments compensates the investor for those defaults that do occur.[5]

A unique aspect of high yield bonds is their default characteristics over the lifespan of an issue. High yield issuers tend to issue debt when they are financially unstable, hoping that the debt will allow them to become more profitable in the future. Thus, most high yield debt defaults occur earlier in the life of the issue. By contrast, investment grade bonds tend to spread out their defaults over their lifespan (see chart below[6]).

[5] For example, take a hypothetical portfolio of high yield bonds worth $10 million with an average yield of 9.0% making annual coupon payments. If the portfolio experiences an annual default rate of 4% and recovers 40% of principal (the historical averages), then the portfolio loses $276,000, or 2.8%, due to these defaults. However, the portfolio would still experience a total return of 6.2%.

[6] Source: Bloomberg.

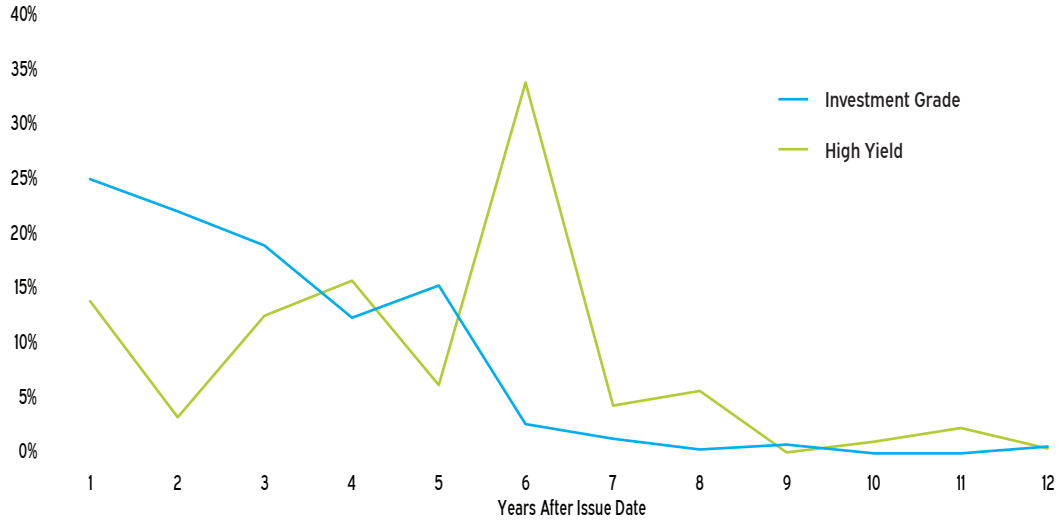

CHART 5
Default Rates as a Percentage of Total Defaults Since Issuance

Source: Bloomberg

Default risk is the main area in which successful bond managers can add value by using fundamental research to avoid downgrades and defaults.

Interest rate risk

Interest rate risk is the driving force behind investment grade bond management, but plays less of a role in high yield bond management. The main reason for this is that default risk tends to overwhelm the effect of changing interest rates on a portfolio of high yield bonds. That is, default rates have a greater impact on the market value and return of a high yield portfolio than changes in interest rates. Put another way, a high yield bond that has its credit rating upgraded should see a narrowing of its spread that far outweighs any effect from interest rate changes.

In addition, interest rate volatility and default rate volatility tend to cancel each other out. Investment grade bonds perform worse when interest rates are rising, a situation that generally occurs in response to strong economic conditions. In this environment, defaults would be expected to shrink, and high yield bonds would consequently perform better than investment grade bonds.

Characteristics of high yield bonds

Expected return and volatility

Even though many call them "junk" bonds, high yield bonds are generally less risky than equities. Returns for high yield bonds are less volatile than for stocks because high yield debt is ahead of equity in the capital structure. Thus, if a company defaults, its bondholders have access to the company's assets before its stockholders. High yield investors consequently have a greater chance of recovering at least part of their investment. Furthermore, high yield returns have a large income component, which stabilizes performance in comparison with stocks. On the other hand, because companies with debt rated below investment grade are more likely to experience a default than are companies rated investment grade, their debt is by definition more risky. Therefore, high yield bonds should theoretically produce returns between investment grade bonds and equities, while also exhibiting volatility between the two asset classes *(see table below)*.

	Cash	Bonds	*High Yield*	Stocks
Annualized Return	3.5%	6.7%	*9.0%*	11.3%
Standard Deviation	0.8%	4.0%	*7.5%*	14.9%

TABLE 1
Return Characteristics (1985 – 2018)[7]

[7] Data for Return Characteristics and Correlation Matrix tables come from the following indices: Cash, the 90 day T-Bill; Bonds, the Barclays Aggregate index; High Yield, the Merrill Lynch High Yield index; Stocks, the Wilshire 5000 index. As the high yield market evolved in the 1980s, several additional indices were developed. Since this data more accurately reflects the current nature of the high yield market, it serves as a better proxy for estimating future return behavior relative to stocks and bonds.

One way an investor can estimate future returns is by applying projected default and recovery rates to the market's current yield to maturity (or more appropriately, the yield to worst, to account for likely call experience). For example, on June 30, 2018 the Merrill Lynch High Yield index exhibited a yield to worst of 6.4%. By subtracting, a combined default and recovery rate equivalent to 400 basis points (based on triple the long-term average default rate), an investor would expect a return of approximately 2.4%, assuming spreads do not change. Of course, there is reason to believe that spreads would narrow during the life of the investment given the severe dislocations in the credit markets.

Correlations

A low correlation means that two asset classes do not have similar investment returns. The correlation between high yield bonds and other asset classes will vary through time. However, in normal market environments, high yield bonds only modestly correlate with equities and investment grade bonds.

The chart below shows the annual returns for high yield bonds, investment grade bonds, and public equities since 1985. The chart serves as pictorial evidence that high yield bonds usually do not closely mimic the returns of equities or investment grade bonds. Note that this correlation may increase in stressed markets, such as in 2008, which poses a tail risk. At the same time the heightened correlation may persist, beneficially, during the rebound from a market stress, such as in 2009.

CHART 6

Annual Returns for High Yield Bonds, Investment Grad Bonds, and Public Equities Since 1985

Historically, high yield bonds correlated little with equities and investment grade bonds (see correlation matrix below). Note, however, that correlations have been increasing over the past five years. Changes in the issuer base have also affected correlations—for example, the high issuance by energy firms caused high yield bonds in aggregate to become more correlated to oil prices in the middle of this decade.

	Cash	Bonds	*High Yield*	Stocks
Cash	1.00			
Bonds	0.22	1.00		
High Yield	*0.00*	*0.28*	*1.00*	
Stocks	0.04	0.12	0.61	1.00

TABLE 2

Correlation Matrix (1985 — 2018)[8]

Correlations tend to trend higher in down markets between high yield bonds and other risk asset classes

	Cash	Bonds	*High Yield*	Stocks
Cash	1.00			
Bonds	0.17	1.00		
High Yield	*-0.01*	*0.37*	*1.00*	
Stocks	0.23	0.36	0.77	1.00

TABLE 3

Correlation Matrix (November 2007 — February 2009)

Return behavior in various environments

The following chart shows the three-year returns for investment grade bonds, high yield bonds, and stocks since 1985. Leadership of the market obviously rotates, with high yield debt usually providing returns between stocks and bonds.

[8] Data for Return Characteristics and Correlation Matrix tables come from on the following indices: Cash, the 90 day T-Bill; Bonds, the Barclays Aggregate index; High Yield, the Merrill Lynch High Yield index; Stocks, the Wilshire 5000 index. As the high yield market evolved in the 1980s, several additional indices were developed. Since this data more accurately reflects the current nature of the high yield market, it serves as a better proxy for estimating future return behavior relative to stocks and bonds.

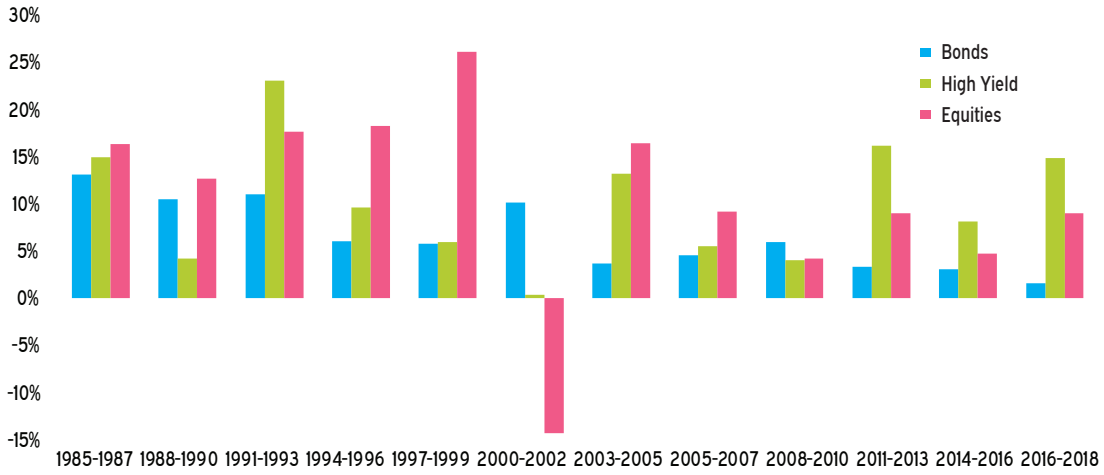

CHART 7

Three-Year Returns for Investment Grade Bonds, High Yield Bonds and Stocks Since 1985

High yield bonds have performed well when investors' expectations about the economy are positive and the outlook for corporate America (and hence, the prospect of making coupon payments) is good. Conversely, in recessionary periods—when defaults tend to rise—high yield returns have lagged.

The table below shows the ***quarterly*** performance of high yield bonds in a variety of environments since 1985.[9] On average, high yield bonds have produced positive returns during periods when bonds produced negative returns. Further, high yield bonds delivered substantially positive returns during periods when stocks and bonds also produced gains.

[9] Cash is measured as the 90 day T-Bill; Bonds, the Barclays Aggregate index; High Yield, the Merrill Lynch High Yield index; Stocks, the Wilshire 5000 index. "Up" periods are quarters when the asset class produced a positive return; "down" periods are quarters when the asset class produced a negative return. Average returns are quarterly.

Market Environment	Average *Quarterly* HY Return	% of Periods HY was Positive	Capture Ratio[10]
Stocks Up	3.4%	90%	47%
Stocks Down	-0.7%	43%	12%
Bonds Up	2.8%	82%	115%
Bonds Down	0.4%	59%	-33%

TABLE 4

[10] The "capture ratio" is a measure of how much of the market's performance high yield bonds "captured"; it is measured by dividing the average return for high yield by the average return for the asset class.

Effect on aggregate bond portfolio

Even a small allocation to high yield bonds will likely result in a better risk-adjusted return than a portfolio comprising solely investment grade bonds. Historically, a portfolio allocated 80% to investment grade bonds and 20% to high yield bonds would have historically produced a higher risk-adjusted return than a portfolio entirely investment grade bonds. The combined portfolio (rebalanced monthly) would have returned 7.3% and the investment grade portfolio would have returned 6.8% from 1985 through June 2018. Yet, the combined portfolio would have experienced slightly lower volatility (3.9% vs. 4.0% standard deviation).

Similarly, based on Meketa Investment Group's 2019 20-year forecasts, a bond portfolio that allocates 80% to investment grade bonds and 20% to high yield bonds has an expected return 60 basis points higher than a portfolio comprising solely investment grade bonds, but with roughly the same standard deviation. Note, however, that as the previous table shows, when stocks are down, high yield's return tends to be negative—so while a shift from investment grade into high yield may increase a portfolio's expected returns and risk-adjusted returns, it is also likely to suffer more downside when equities are down too.

Role of high yield bonds—strategic vs. tactical

Total portfolio context

The role of traditional bonds in diversified investment programs is to control equity volatility and provide a predictable level of income. High yield bonds can help achieve these goals by providing a higher level of income than investment grade bonds while presenting less risk than equities. Their low correlation with other asset classes and their lower expected volatility than equities make high yield bonds an attractive asset class in a portfolio context.

> However, because spreads fluctuate, we would recommend not completely exiting the asset class even when valuations turn unfavorable.

In many cases, more efficient portfolios could potentially be achieved by incorporating high yield bonds into a traditional stock-bond portfolio.[11] However, the discussion of the efficient frontier is based upon assumptions about the ***long-term*** characteristics of the component asset classes' returns, volatilities, and correlations.

[11] This is largely the result of high yield having had especially attractive risk-return characteristics as of the start of 2009.

High yield bonds are intermediate between stocks and investment grade bonds in the capital structure: stock returns are based upon a hold on future earnings, which only are paid out after bonds, whose returns are from a promise of payment for debt—and for high yield their ability to make those debt payments is tied to future earnings. Thus they are essentially hybrids of equity (due to credit quality) and fixed income (due to interest rate exposure), and could be created synthetically by mixing equities and bonds. In practice, though, such a synthetic blend does not replicate the performance of the high yield bond asset over the short term, because their valuations differ. That is, due to investor demand, the price of high yield bonds may differ from that of their "equivalent" blend. Over longer periods, we would expect variations to average out: for example, the 20-year expected return of a 60/40 U.S.

equity and investment grade bond portfolio would slightly outperform high yield bonds by roughly 27 bps, with 60 bps lower risk.

It is for this valuation reason that the level of allocation to high yield bonds may vary substantially over time. A measure of the attractiveness of high yield bonds is their spread over AAA-rated investment grade bonds; in fact, valuations for high yield bonds may be more predictive over the short term than they are for other asset classes. As shown in the following chart, currently the breakeven is at 5.7%—if high yield bonds are yielding less than 570 basis points above their AAA counterparts, then one can do better investing in a mix of stocks and investment grade bonds. However, because spreads fluctuate, we would recommend not completely exiting the asset class even when valuations turn unfavorable. Instead, an investor should maintain a minimum ("toehold") position with a high yield bond fund. Doing so enables one to rapidly implement a re-allocation when markets shift, without the delays of having to approve a manager and set up an account.[12]

[12] This approach presupposes that an investor's governance structure would allow it to make such a shift with relative speed. If not, an alternative would be to delegate the decision and timing to a broad-mandate fixed income manager.

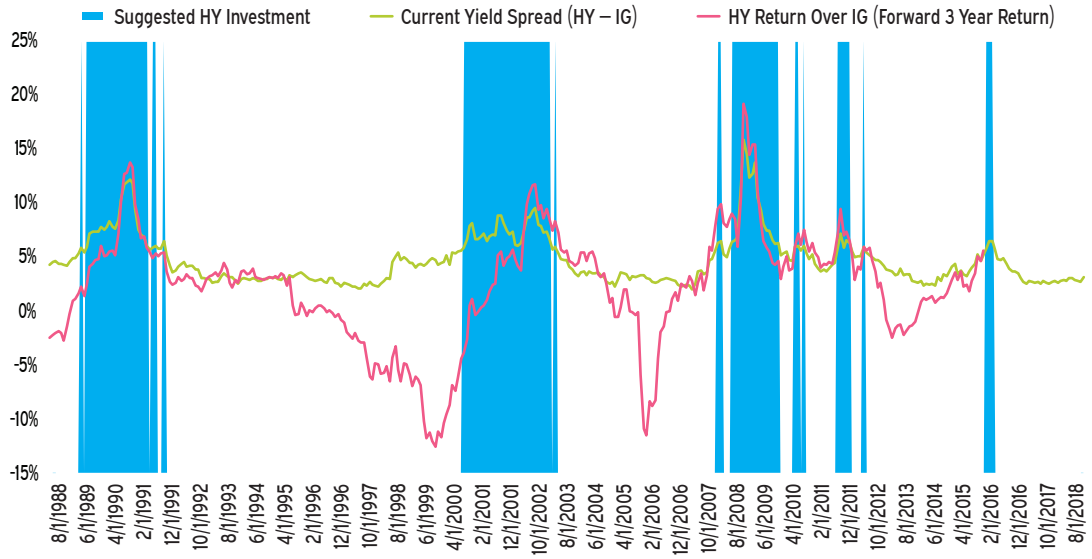

CHART 8
HY and the IG Spread—Evidence for Varying Strategic Position

Implementation issues

Market liquidity

As of October 2018, there were approximately 3,500 outstanding high yield issues and 2000 issuers included in the Barclays High Yield index, with an aggregate market value of $1.25 trillion. This represented approximately one-fifth of the total outstanding issuance of corporate debt tracked by Barclays. The Barclays High Yield index includes the most liquid bonds based on issue size, and excludes a large amount of smaller (and less liquid) high yield debt issues that are estimated to have a market value of $550 billion in aggregate.

Liquidity for the high yield bond market does not approach that for investment grade bonds, because of the small relative size of the high yield bond market and the limited number of participants in this area of the market. Consequently, it is more expensive to trade high yield bonds than it is to trade investment grade corporate bonds. Bid-ask spreads range broadly for high yield bonds, with approximately 80% of issuers trading at spreads of 25 bp to 200 bp, depending on quality.[13] For less liquid issues, bid-ask spreads can widen beyond 400 bp. Further, during periods of high volatility (e.g., the Asian currency crisis in 1998), spreads for high yield bonds widen, at least temporarily.

[13] Source: JP Morgan Securities..

The limited liquidity of high yield bonds makes it imperative that skilled and experienced personnel conduct trading. In addition, the amount of high yield bond assets that one firm can manage effectively is constrained by the relative illiquidity of this market. For this reason, some managers have closed their products to new investors when assets under management reached the $10 to $20 billion range.

Diversification

An issue-specific event (e.g., a default) can cause the spread on a particular issuer's bonds to widen precipitously. This happened with Lehman Brothers bonds in 2008, where the spread grew from approximately 600 bps to 40,160 bps instantaneously! In a portfolio of thirty bonds, if a single bond defaults (assuming a 40% recovery), the portfolio will experience a 2% loss. Because high yield bonds are far more prone to these events than investment grade bonds, diversification is more important in high yield portfolios than in investment grade portfolios.

Active management

For institutional investors, specialized high yield bond management has been growing over the last 15-20 years. A growing number of firms offer dedicated high yield bond management, although the universe has not grown to the size of the investment grade market.

An active manager who can hold a portfolio with fewer defaults than the market while maintaining a yield similar to the benchmark will outperform the market. Similarly, by selling securities prior to downgrades and purchasing issues before upgrades, a manager can add significant value relative to a passive index investment. In addition, reducing defaults will reduce the volatility of high yield bond returns.

The table below compares the average alpha (outperformance/underperformance) for several universes[14] of active bond managers versus their respective benchmarks for the five-year period ended December 2018. The data implies that active management has not been beneficial in high yield compared to investment grade in the recent market environment. This is largely due to most active managers taking less risk than the high yield index, which, in a low default environment, mean they are likely to underperform.

[14] The Core, Core Plus, and High Yield universes respectively comprise 251, 131, and 203 SEC-registered mutual funds whose returns are published by eVestments, gross of fees. The benchmarks used for the Core, Core Plus, and High Yield universes are the Barclays Aggregate, Barclays Universal, and Barclays High Yield indices, respectively. .

	25th Percentile Manager	Median Manager	75th Percentile Manager
Core	+55 bp	+30 bp	+12 bp
Core Plus	+71 bp	+35 bp	+5 bp
High Yield	+42 bp	-3 bp	-54 bp

TABLE 5

Benchmark

Several benchmarks are available to high yield bond investors. The most commonly used are the Barclays U.S. Corporate High Yield index and the CSFB High Yield index.[15]

[15] Others include the Merrill Lynch High Yield Master Index family..

	Barclays	Merrill Lynch	CSFB
Minimum Issue Size	$150 mm	$100 mm	$75 mm
Includes Split Ratings	No	Yes	Yes
Includes Defaults	No	No	Yes
Includes 144a's	Yes	Yes	Yes[16]
Fallen Angels Added	Monthly	Monthly	3 Months
Includes Emerging Markets	No	Yes[17]	Yes
Includes non-U.S.$ Denominated	No	No	No

TABLE 6

[16] 144a issues must have registration rights to qualify for the CSFB index.

[17] Only if emerging country has investment grade sovereign debt.

Although dispersion between index returns should be minimal over longer periods, short-term deviations make it important to choose the proper index for comparison to the style of the manager hired. For example, the CSFB index might be the best benchmark for a manager who includes emerging market debt and smaller issues in their investable universe. Alternatively, a manager who invests only in highly liquid issues and excludes emerging market debt might best be measured against the Barclays index.

Timing

Even sophisticated investors often err in presuming that the recent past will persist indefinitely. An investor who entered the high yield market at the start of 2003 might have been surprised to receive 27.2%, especially after the ho-hum years of 1998 through 2002. Similarly, an investor enamored by the relatively steady returns from 2004-2007 would have suffered considerable losses in 2008. Investors who entered the market during in the tail end of the Great Recession would have seen considerable gains in the following decade.

Annualized High Yield Performance[18]

1998—2002	1.2%
2003	27.2%
2004—2007	6.8%
2008	-26.2%
2009—2017	15.5%
2018	-2.2%

TABLE 7

[18] Returns are for the Merrill Lynch High Yield Master I index.

Because high yield bonds have more volatility than investment grade bonds, but less volatility than equities, the risk of mistiming an entry into the high yield bond market is moderate, but not as high as with equities. The chart below shows that, despite the weak market of 2000-2002, high yield bonds did not experience a negative return on a rolling three-year basis. However, the enormous declines in 2008 pushed the relevant rolling three-year averages into negative territory. The large uptick following the global financial crisis has brought high yield bonds returns positive, even outperforming equities post 2012.

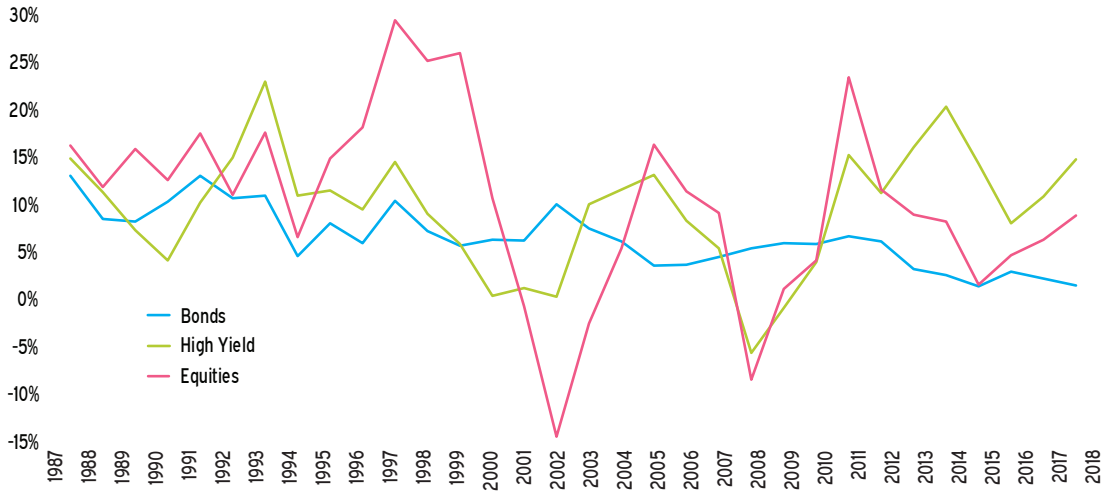

CHART 9
Rolling Three-Year Returns

Unsurprisingly, the most profitable times to invest in high yield bonds have been when yields were historically high relative to U.S. Treasuries, i.e. when "spreads" were wide. In 1990, the spread for the Barclays High Yield index peaked at approximately 1,300 basis points (thirteen percentage points) over Treasuries. Subsequently, the high yield market produced an average annual return of 23 % over the next three years. In late 2002, spreads approached the 1,000 basis point mark, and high yield bonds once again rebounded, producing a 32% gain over the subsequent twelve months. Calendar year 2018 saw spreads, relative to Treasuries, at lows similar to that of the years between 2005 and 2007. This typically indicates a relatively poor time to invest, as one cannot know how wide spreads will become.

The quality spectrum

Over long periods, the portion of high yield indexes with bonds rated BB and B have produced positive returns (see table below). In particular, the BB-rated portion of the index have experienced a higher risk-adjusted return, as indicated by the superior Sharpe ratio. Historically, investors have not been rewarded for holding a dedicated allocation to the portion of the index rated CCC (Caa) or lower. These bonds have produced inferior returns, while experiencing substantial volatility, contrary to modern portfolio theory, which expects higher returns over long periods to compensate for increased risk.

Consequently, we recommend that high yield managers invest the vast majority of their portfolio in the BB- and B-rated portions of the high yield universe. However, because lower rated debt can significantly outperform for brief periods, we recommend that guidelines permit managers to shift tactically into and out of bonds rated CCC and lower.

	BB	B	CCC-C
Annualized Return	7.1%	6.4%	7.5%
Annualized Risk	7.1%	8.7%	14.0%
Sharpe Ratio	0.98	0.72	0.52
Best Month	7.6%	11.0%	19.6%
Worst Month	-15.1%	-14.6%	-22.8%

TABLE 8
Historical Performance[19]

[19] Represents the period from January 1997 through September 2018. Returns from Merrill Lynch sub-indices. Note that the bond holdings in an index rotate as the individual issues' ratings evolve, e.g., well-performing CCC rated bonds may be re-rated as B, changing the sub-index to which they are assigned.

Vehicle

Investors who seek a custom portfolio, or customized guidelines, must utilize a separate account structure. The investment manager could then construct a portfolio to match the requirements of the investor. However, the illiquidity of the market suggests that investors who plan to invest less than $5 million in high yield bonds utilize a commingled vehicle, so that a diversified portfolio can be constructed and trading costs will not eat away at returns. For investors who plan to use this vehicle as a source of liquidity, we recommend $10 million as the minimum for a separate account.

Investable universe

Many "high yield" managers include in their investable universe securities that are not considered traditional high yield debt (or included in the benchmarks), but that either trade like high yield bonds or are a hybrid security. These securities include bank loans (i.e., leveraged loans), "busted" convertible bonds, preferred stock, credit default swaps, and CDOs and similarly structured debt. Managers with such wide discretion may be more properly described as "broad credit."

- **Bank loans** are loans made by banks to highly leveraged companies. These companies generally have a below investment grade rating. Bank loans are often floating-rate instruments, and tend to be short term in maturity. Bank loans usually hold the highest (i.e., most senior) position in the capital structure, resulting in a lower yield than the debt the same company issues to the public. The investor is buying a piece of the original loan, which is usually syndicated by the originating bank. Because banks and the holders of bank debt are privy to non-public information, steps must be taken to ensure that a high yield manager who holds bank debt does not abuse this insider information. Still, its senior position in the capital structure combined with the defensive nature of its floating-rate structure makes bank debt an attractive investment option for high yield portfolios.

- **Convertible bonds** are bonds convertible into equity at a predetermined price. When the underlying stock price drops significantly below the strike price, the bonds effectively become "busted" and trade like standard high yield bonds. As long as these bonds trade far "out of the money," they have an appropriate role in high yield portfolios. Similarly, **preferred equities** (fixed-rate and variable-rate stock that has preference over common stock concerning dividends and liquidation of the issuer) that pay a high dividend generally trade more like high yield offerings. They may likewise be appropriate due to the similarity in their characteristics and in the analysis performed on these assets.

- **CDOs, CBOs and CLOs** are forms of collateralized obligations, or structured debt. Like other forms of structured debt instruments (e.g., CMO's), they represent the repackaging and reselling of existing debt instruments in the form of tranches of differing quality. The purchase of these products requires investment in a pooled vehicle. Hence, the manager is passing judgment on the manager of that vehicle, not just the underlying bonds in the investment. As the manager was likely hired to evaluate bonds, not other managers, an investor may want to prohibit their manager from investing in CDO's, et al. However, if guidelines are put in place limiting their use and credit quality, they should be allowed to constitute a minor portion of high yield portfolios.

- **Credit default swaps** are a mechanism to purchase or sell default insurance. As a purchaser of a credit default swap, the manager pays a premium to enter into an arrangement that protects a portfolio holding in the event of a default. As a seller of a credit default swap, the manager collects a premium for underwriting default insurance. Consequently, managers may use credit default swaps to obtain credit default protection or enhance portfolio income. The likelihood of an issue defaulting is priced into the credit default swap for that particular issue. While more regulations were set in place after the global financial crisis, this market is still maturing in terms of regulation and standardization. Hence, swaps may not actually provide the protection that they supposedly offer. Consequently, we currently recommend avoiding credit default swaps.

Investors should decide whether to allow a high yield manager to invest in these ex benchmark instruments on a case-by-case basis. Each instrument carries risks that are not present in the benchmark. If a manager has shown expertise in using one or more of these instruments, then we recommend they be allowed to invest in them, given appropriate guidelines to control their impact on returns, since the "added value" may simply derive from taking on additional and potentially unintended risks.

Core plus?

Many funds choose to achieve their exposure to high yield tactically, through the use of a "core plus" manager. However, this presents three problems. First, core plus managers often lack the expertise necessary to excel in the high yield bond market. Second, tactical shifts by the manager in and out of high yield prevent the Fund from maintaining control of the Fund's exposure to the high yield market. Third, core plus managers often manage portfolios with far more risk than the benchmarks against which they are measured.

Most core plus managers are firms that have a long track record of managing investment grade bond portfolios. In an attempt to outperform their benchmark, usually the Barclays Aggregate, many of these managers started investing outside the benchmark in the 1990s. These ex-benchmark investments generally constituted 5% to 15% of the portfolio and usually comprised high yield, emerging market, and non-dollar denominated debt.

Management fees for high yield bond portfolios range from 30 to 125 basis points per year, far higher than the fees for investment grade bonds.

Because these firms are typically structured to manage investment grade portfolios, they may lack the resources necessary to maneuver in the high yield bond market. Managing high yield bonds requires significant research and trading resources. Little information is publicly available in the high yield market. For many issues, high yield bond managers must provide all or most of the necessary detailed research. This lack of expertise can be costly in an inefficient market like high yield debt. Furthermore, because core plus managers move in and out of the high yield market, their investable universe may be limited to only the largest, most liquid high yield names.

When core plus managers switch between investment grade and high yield debt, they change the risk profile of their portfolio. For example, there is significantly more risk inherent in a B-rated corporate bond than a 10-year Treasury bond. These shifts may come at inappropriate times for the Fund.

For most core plus managers, the most appropriate benchmark might be the Barclays Universal index, which includes high yield and emerging market debt. However, a manager's frequent movements in and out of these sectors and other non-benchmark sectors (e.g., TIPS) can make performance measurement versus this benchmark frustrating for a core plus manager.

Considering the above factors, Meketa Investment Group recommends that most funds separate investment grade bond management from high yield management. This simplifies performance attribution, allows for Board-level control of a fund's high yield allocation and risk-posture, and makes for best use of specialized high yield managers.

Expenses

Managing high yield bonds requires significant research and trading resources. The greater resources required by high yield bond managers lead to higher management expenses. Management fees for high yield bond portfolios range from 30 to 125 basis points per year, far higher than the fees for investment grade bonds. Custody fees, though not prohibitive, will vary with the size and turnover of the portfolio.

Summary and recommendations

Three types of risk permeate today's high yield bond market: liquidity risk, interest rate risk, and default risk. Liquidity risk has become an increasing concern post financial crisis due to increased regulation. The most meaningful risk is default risk, though default rates overstate the actual loss an investor experiences. Interest rate risk plays only a minor role, because default risk tends to overwhelm the effect of changing interest rates on a portfolio of high yield bonds.

Despite the nickname of "junk" bonds, high yield bonds are less risky than public equities. Nevertheless, because these companies are more likely to experience a default than companies who are rated investment grade, they are more risky than investment grade bond issuers are. Consequently, high yield bonds should produce returns between investment grade bonds and equities, while also exhibiting volatility between the two asset classes.

Due to their modest correlation with other asset classes and attractive historical returns, high yield bonds play a substantive role in almost every portfolio on the efficient frontier. This indicates that more efficient portfolios (i.e., with higher risk-

adjusted returns) can often be achieved by incorporating high yield bonds into a traditional stock-bond portfolio. Meketa Investment Group therefore recommends that most diversified long-term funds consider allocating as much as five percent of total assets to high yield bonds, and perhaps more when credit spreads are particularly wide.

Their attractive yield makes high yield particularly appealing to short-term funds whose asset allocations are typically dominated by low yield, investment grade bonds. However, investors should be mindful that substituting high yield bonds for investment grade will decrease a portfolio's overall credit quality and thus its bond allocation's protective characteristics as a hedge against equity will decline.

The use of "core plus" managers to achieve exposure to high yield presents three challenges. First, core plus managers may lack the expertise necessary to excel in the high yield bond market. Second, tactical shifts by the manager prevent an investor from maintaining control of their exposure to the high yield market. Third, core plus managers often manage portfolios with far more risk than the benchmarks they are being measured against. Hence, we recommend separating investment grade bond management from high yield management to overcome these obstacles. This would simplify performance attribution, allow for Trustee-level control of a fund's high yield allocation, and make for best use of specialized high yield managers.

Recent historical data implies that active management has not been more beneficial in the high yield market than in the investment grade bond market. In addition, investors have not been rewarded for holding the portion of the bond index rated CCC, CC, or C. Consequently, we recommend that investors who utilize active high yield managers choose those that invest the vast majority of their portfolios in the BB- and B-rated portions of the bond universe. However, we do recommend that guidelines permit a manager to invest in lower rated bonds and ex-benchmark instruments, if the manager has demonstrated expertise in these areas.

Appendix A

	Bonds	High Yield	Equities
1985	22.1%	24.6%	22.0%
1986	15.3%	16.3%	14.9%
1987	2.7%	4.7%	-9.3%
1988	7.9%	13.4%	13.0%
1989	14.5%	4.2%	20.9%
1990	8.9%	-4.3%	1.3%
1991	16.0%	34.6%	28.0%
1992	7.4%	18.2%	9.2%
1993	9.8%	17.2%	9.9%
1994	-2.9%	-1.2%	-3.1%
1995	18.5%	19.9%	33.6%
1996	3.6%	11.1%	18.0%
1997	9.7%	13.3%	24.6%
1998	8.7%	3.0%	22.8%
1999	-0.8%	2.5%	19.2%
2000	11.6%	-5.1%	-7.0%
2001	8.4%	4.5%	-14.3%
2002	10.3%	-1.9%	-19.9%
2003	4.1%	28.1%	35.0%
2004	4.3%	10.9%	10.0%
2005	2.4%	2.8%	9.2%
2006	4.3%	11.8%	11.8%
2007	7.0%	2.2%	3.6%
2008	5.2%	-26.4%	-33.2%
2009	5.9%	57.5%	39.7%
2010	6.5%	15.2%	21.3%
2011	7.8%	4.4%	-1.1%
2012	4.2%	15.6%	10.6%
2013	-2.0%	7.4%	26.2%
2014	6.0%	2.5%	16.4%
2015	0.5%	-4.6%	3.5%
2016	2.6%	17.5%	19.9%
2017	3.2%	7.5%	18.9%
2018	0.0%	-2.2%	-10.0%

TABLE 9

Calendar Year Performance[20]

[20] Bonds are measured as the Barclays Aggregate index; High Yield, the Merrill Lynch High Yield Master index; Stocks, the Wilshire 5000 index.

Appendix B

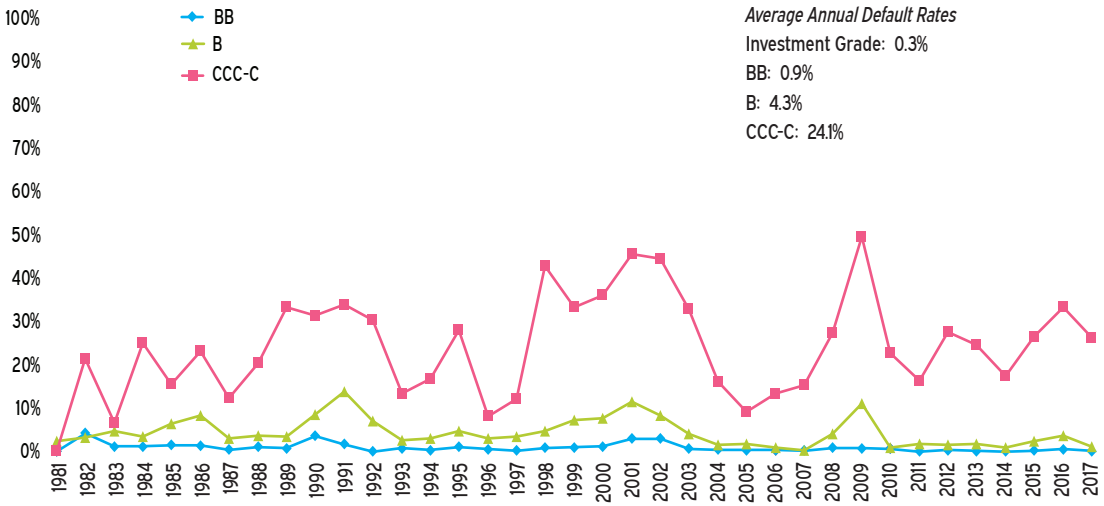

CHART 10

Default Rates by Rating 1981 — 2017

Source: S&P Global Corporate Default Study

TABLE 10

Equities-Bonds-High Yield (%)	60-40-0	60-30-10	55-30-15	20-80-0	20-60-20	15-70-15
U.S. Equities	60%	60%	55%	20%	20%	15%
Bonds	40%	30%	30%	80%	60%	70%
High Yield Bonds	0%	10%	15%	0%	20%	15%
Expected Return	4.52%	4.79%	5.02%	5.22%	5.74%	5.69%
Standard Deviation	5.96%	6.05%	6.65%	10.19%	10.50%	10.93%
Sharpe Ratio	0.27	0.31	0.32	0.23	0.27	0.25

Investing in CCC and lower debt has not paid off historically; however, these markets tend to be less efficient (fewer fallen angels, hence, less analyst coverage), allowing for greater outperformance. Therefore, only the best active managers with the deepest research teams should receive permission to dive into the deep end of the high yield pool, and only investors who have a healthy risk appetite should use these managers. In addition, the data is slightly skewed in favor of BB bonds due to two factors: 1) declining interest rates have benefited BB rated bonds more than their lower rated counterparts where duration has less of an impact; and 2) the past five years have been particularly bad for lower rated credits, hence there is some endpoint bias.

The ultimate return for high yield bonds is a function of interest rates, credit spreads, default rates, recovery rates, and put/call experiences. The best way to estimate the result of these interconnected forces is to generate a high yield risk premium, which accounts for default risk, call risk, liquidity risk, spread risk, etc. Similarly, we estimate standard deviation to be approximately twice that of investment grade bonds.

Appendix C

Glossary

Duration

Duration is usually defined as a bond's sensitivity to a change in interest rates. Changes in interest rates tend to be the key determinant of bond returns over short time periods. However, interest rates play a lesser role in the returns of high yield bonds. As described earlier, default and liquidity risk are important in pricing high yield bonds, and default risk tends to overwhelm the effect of changing interest rates on a portfolio of high yield bonds.

Because, interest rate volatility and default rate volatility tend to cancel each other out much of the time, duration is not as meaningful a tool for high yield bond portfolios as it is for investment grade bonds. However, because interest rates do play a role, it is important to calculate the duration of a high yield portfolio and include this in the calculation of the aggregate bond portfolio.

The vast majority of high yield issues are callable after three to five years. Therefore, high yield bonds rarely mature; rather, they are often called several years before their maturity date. Hence, there is very little "short-term" debt outstanding in the high yield market. Further, the majority of high yield bond issuance has an original term to maturity of ten years or less. Consequently, most of the outstanding issues exhibit a maturity between three and ten years. This translates to a duration near the lower half of this range. In most periods, this will result in a duration similar to that of the investment grade market.

High yield bonds will have a shorter duration than bonds of similar maturity because investors receive a greater portion of their total return through coupon payments with high yield bonds. Combined with their limited maturity spectrum, this results in smaller swings in the duration of the aggregate high yield market vis-à-vis the aggregate investment grade market. Hence, a portfolio of high yield bonds will not significantly affect the duration of an aggregate bond portfolio, nor will it increase the volatility of the aggregate portfolio's duration.

Emerging market debt

Merrill Lynch and CSFB include emerging market debt in their benchmarks, while Lehman and Citigroup do not. Not surprisingly, some managers will choose to invest in emerging market debt, while others avoid it. EM debt is a suitable investment for a small portion of most high yield portfolios, but it incorporates additional risks. For example, investing in EM debt requires passing judgment not just on the issuer, but the country that issuer is based in and often its currency. Few managers have

demonstrated the ability to move tactically in and out of this market successfully. For investors who feel strongly about EM debt, they should consider making a separate strategic allocation.

Quality

High yield bonds are rated below investment grade by one or more of the major ratings agencies. Even within the below investment grade sector, quality can vary. As of September 30, 2018, the Barclays Global High Yield was comprised 47% of BB (Ba)-rated issues, 41% of B-rated issues, 9% of CCC (Caa)-rated issues, 1% of issues rated CC (Ca) or lower, and 2% of non-rated issues.[21]

[21] Standard & Poor's and Fitch use the all-capital-letter ratings; Moody's uses the capital-lowercase-letter-number ratings.

Naturally, an increased allocation to high yield bonds will decrease the overall credit quality of a bond portfolio. An aggregate portfolio managed entirely by investment grade bond managers, who tend to maintain a slightly lower quality than then index, would generally exhibit an average quality rating of AA+ (Aa1). A portfolio allocated 80% to investment grade bonds and 20% to high yield bonds would likely exhibit an average quality rating of approximately A+ (A1).

S&P offers the following definitions with respect to default risk for their ratings of below investment grade bonds:

- ***BB*** *"little near-term weakness but faces major ongoing uncertainties or exposure to adverse business, financial, or economic conditions that could lead to inadequate capacity to repay principal and interest."*

- ***B*** *"currently has the ability to pay principal and interest; poor economic or business conditions would likely impair the ability to repay principal and interest."*

- ***CCC*** *"currently susceptible to default; repayment is dependent on favorable economic and business conditions."*

Vehicle

Assuming that we would like to see a portfolio of at least 50 names (for diversification reasons), and that the size of each position should be $100,000 (for liquidity reasons), then it follows that an investor should commit at least $5 million to high yield if they wish to use a separate account structure. The industry standard is moving toward managers who have set separate account minimums of $10 million to $25 million.

Yield

Investors demand a higher yield to compensate them for taking on the greater risks involved with investing in bonds rated below investment grade. Thus, this class of bonds is commonly referred to as "high yield" because of the higher level of income

offered relative to Treasuries, mortgage-backed securities, and investment grade corporate bonds. Consequently, an increased allocation to high yield bonds will substantially enhance the yield of an aggregate bond portfolio.

The average yield spread over like-maturity Treasury bonds will vary significantly over time. However, by making some assumptions using the indices as proxies, one can arrive at an estimated change in yield over a portfolio comprised solely of investment grade bonds.

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