



For the long-run: capital-market assumptions 2018

We are introducing our long-term return assumptions for various asset classes.

Don't put all your eggs in one basket. That's a time-honored piece of advice, and rightly so. By buying shares in one particular company, for example, you may be taking a lot more risk for the same likely reward that you could get by investing in a wider range of companies. However, buying shares across many different companies and sectors still exposes you to the whole equity market going down. If you seek a steady stream of income in retirement, say, you should consider adding some sovereign bonds. Often, such securities offer the potential to do well precisely when equity markets go down. A recession, for example, hurts corporate earnings and valuations. At the same time, it leads to falling interest rates. This, in turn, is likely to increase the price of the sovereign bonds in your portfolio.

Of course, holding only U.S. Treasuries and American stocks can still leave you exposed to some risks. High rates of inflation, for example, can damage both. Historically, investors have been less prepared to put a high stock market multiple on company earnings at times of high inflation, partly because during such periods, earnings tend to be fairly volatile.

Taking risks in other ways, such as with high-yielding U.S. bonds may also help to stabilize a portfolio further. Such highly leveraged companies tend to benefit from unexpected inflation spikes. Their earnings and revenues go up in nominal terms, while their coupon stays the same, tending to make their debt load more bearable.

Even a portfolio across a wide range of traditional and alternative U.S. assets can suffer from threats affecting the whole economy. Policy errors can drag down economic growth potential and hurt the U.S. dollar. Spreading holdings across a wide range of countries may help to mitigate such risks, including geopolitical ones. And as with U.S. Treasuries, you might be prepared to pay a premium for assets that have proven a safe haven during past periods of turmoil. Gold and pretty much anything denominated in Swiss Franks come to mind.

Diversification makes intuitive sense.

Putting this intuition into practice, however, is most often a matter of judgment. Partly it's about comparing one's own risk with the level of potential risk in investments in particular asset classes in the past by looking at measures of the variability in returns. Partly it's about assessing correlations within and across various asset classes.

There is a third, critical ingredient: expected returns over the planned investment horizon. What returns may the chosen portfolio

Christian Hille
Head of Multi Asset



In a nutshell

- This paper describes our proprietary return assumptions over the long run, covering fixed income, equities and alternatives.
- We outline our key findings, as well as provide brief introductions to the methodologies used.
- These illustrate the importance of strategic asset allocation, based on a stringent analytical framework.

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likely generate, given current market conditions? Are the potential returns satisfactory or sufficient to justify the risk taken? Having reasonable answers to these questions can help to figure out how much risk an investor might wish (or need) to take, and can serve as a useful starting point for constructing portfolios.

In that spirit, we have in recent years put a lot of effort into deriving our own proprietary long-run return assumptions. This publication highlights some of our key findings and results, as well as providing brief introductions to the methodologies we used. In the remaining sections, we cover fixed income, equities and alternatives. We conclude with some final observations.

Fixed-income returns

Figuring out the nominal expected return is pretty straightforward in fixed income, as long as your investment horizon exactly corresponds with the duration of the bonds in question. Simply defined, a bond's duration is the weighted average of how long it will take for an investor to get repaid, i.e. the time until each interest (coupon) and principal payment of a bond becomes due. Given how low interest rates currently are, a bond's duration is very close to its maturity – the remaining time until the principal amount is paid back.

Let's say you buy a 10-year Treasury with a 2.5% yield trading at par. You intend to hold it until it matures. So, you know that you are likely to receive \$100 back in 10 years' time (except for the unlikely event that the U.S. government becomes insolvent). You also know that each year, you will collect coupon payments of 2.5% of the face value, i.e. \$2.5. The only thing you don't know is what yields you will get when you reinvest the coupons for the remaining term.

Things get a little trickier if you buy a 10-year Treasury today, which you only plan to hold for 5 years. You now have a coupon and a price component to deal with. Fortunately, there is an easy way to at least get a first, baseline estimate of your returns that neatly resolves the issue of reinvesting coupons as well. You simply look up the interest rates on U.S. Treasuries of varying maturities. This gives you the yield curve on U.S. Treasuries as of today. With this chart, you can estimate your expected return. That is assuming the future yield curve will be the same as the current yield curve. This allows you to calculate how much all your bonds are likely to be worth, if you sell them before they mature.

A constant yield curve means that the yield on your initial 10-year Treasury will be only about 2.2% in 2022. If you bought your bond at 2.5% yield, this means that its value has to go to \$101.41 over the next 5 years. This price gain is called the roll down effect, and it can be a very important component of bond returns when the yield curve is upward sloping. (The steeper the curve, the bigger the initial impact, which will fade again as the bond matures.)

A constant yield curve also makes it easy to calculate the returns on reinvested coupons. For the first one due in a year's time, you simply pencil investing \$2.5 at the yield level in line with where 9-

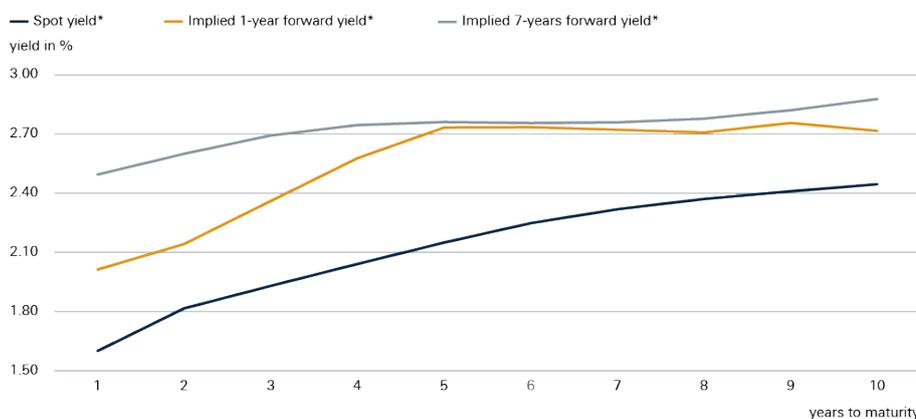
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year Treasuries are currently trading¹. Your total expected nominal returns are simply the coupons on the initial bond, roll down, and proceeds from re-investing coupons at yields in line with the current yield curve.

In principle, you can use this approach for any fixed-income instrument that is priced according to a yield curve. Whether a constant yield curve is really the best estimate is a matter of judgment. Another approach would be to use forward rates – what sorts of future yields the market is currently pricing in. From an investment perspective, there are advantages to using this approach; in particular, Diebold and Rudebusch (2013) showed that there is valuable information contained in the yield curves implied by forward rates. The differences tend to be highly significant, as the chart below illustrates.

The current U.S. Treasury yield curve versus implied yield curves



Source: Bloomberg Finance L.P. as of 11/30/17

There are advantages and disadvantages to both. We therefore tend to use a blended approach. So far, so good for U.S. Treasuries. For a portfolio of sovereign bonds from different countries, you would want to include two additional considerations. First, your portfolio is likely to include some sovereigns with non-negligible default risk. And second, some bonds might see their ratings change over time. We use historic data to assess long-term default probabilities, recovery rates and rating migration.

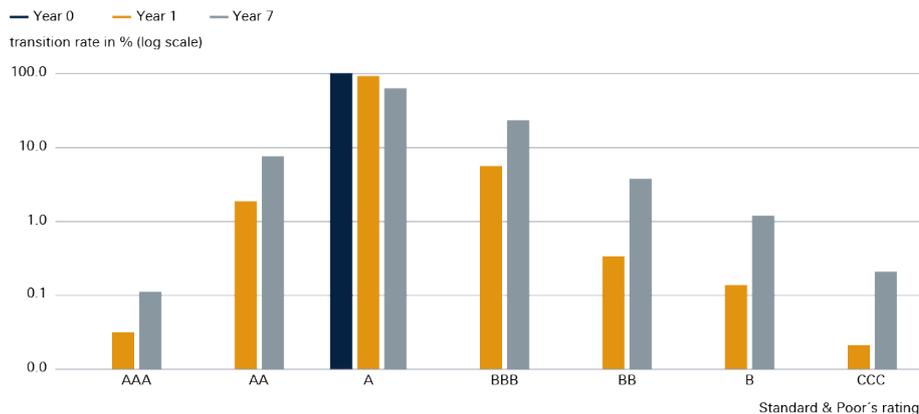
This is particularly relevant for corporate bonds. For example, historic data suggests that A-rated corporate borrowers from around the world have about a 5% probability to see their rating downgraded to BBB within the next year.

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¹In actual fact, both 9-year and 10-year Treasuries happen to be trading at about 2.4% at the time of writing. All articles are available on <https://deutscheam.com/cio-view>



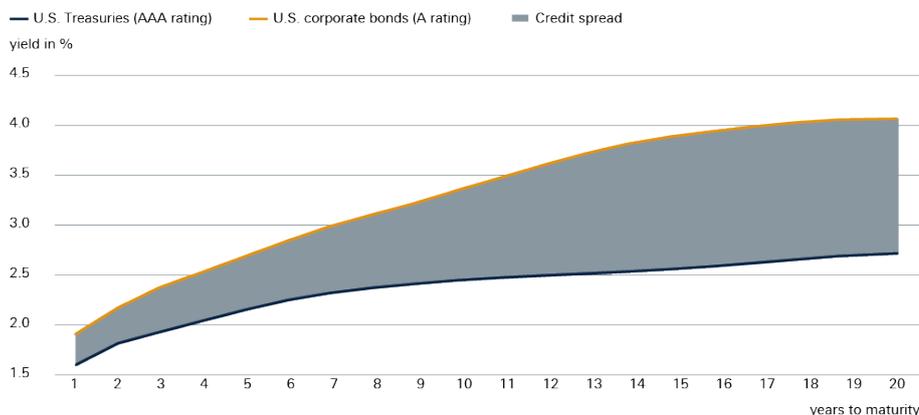
Average rating migration of A-rated corporate borrowers globally (1981 - 2015)



Source: Standard & Poor's RatingsDirect, "Default, Transition, and Recovery: 2016 Annual Global Corporate Default Study And Rating Transitions" as of 4/13/17

U.S. corporate bonds, like many other bonds, are priced by their spread compared to very low risk sovereign bonds, in this case U.S. Treasuries. To calculate their returns, you need assumptions on how credit spreads will evolve over time. For example, spreads on U.S. corporate bonds have recently been trading at historically low levels. Such changes tend to be negatively correlated with sovereign bond yields. So, in an environment where we expect the Treasury yield curve to flatten in the near term (due to, for example, growing risks of a U.S. recession), spreads on corporate bonds are likely to widen. At times, this correlation can also turn positive, for example when rates are rising during times of strong economic growth, strengthening corporate balance sheet. As a bond matures, there is also a natural tendency towards spread compression. The shorter the remaining term, the lower, all else equal, the likelihood that the issuer will default.

Yields and spreads of U.S. corporate bonds (A rating)



Source: Bloomberg Finance L.P. as of 11/30/17

Take it all together and add a few twists related to more complex instruments, and it becomes possible to forecast comparable returns across a wide range of fixed-income assets. The results are provided below.

Long-term fixed income returns (7-10 year horizon)

All articles are available on <https://deutscheam.com/cio-view>

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Asset Class	Forecasted Return (in %) ¹
Eurozone sovereign bonds ²	0.7
Euro corporate bonds ²	1.2
Euro high-yield bonds	2.7
U.S. Treasuries ²	2.1
U.S. corporate bonds	3.0
U.S. high-yield bonds	3.6
Emerging-market external sovereign bonds ³	5.1

Source: Multi Asset Group, Deutsche Asset Management Investment GmbH as of 11/30/17

¹Assuming investors hold those securities until maturity

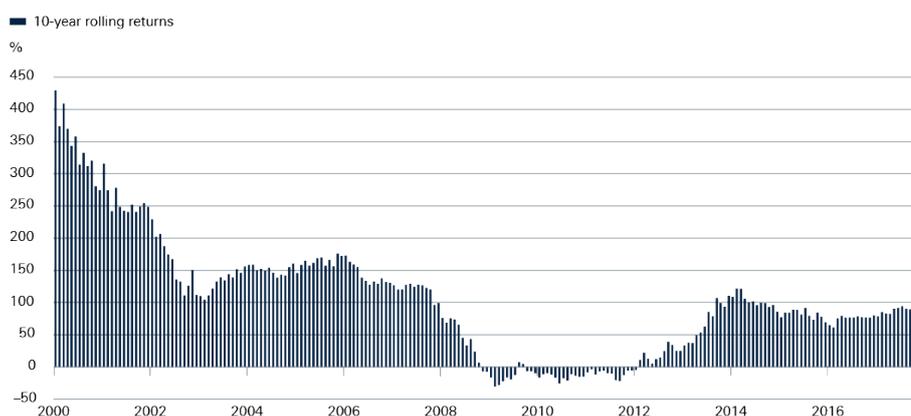
²Remaining maturity: 5-7 years

³JP Morgan EMBI Global Composite Index

Equities returns

Traditionally, investors have tended to rely on historical average data when assessing equities returns. Typically, they have taken long-term government-bond rates of the country in question as a proxy for the risk-free rate and added an equity risk premium based on average historic outperformance. This would suggest that in the long run, it is worth considering owning equities. However, history clearly shows that 10-year periods of zero or even negative equity returns do occur, as the following chart shows. Consequently, other approaches are needed to derive more realistic and accurate expectations of future long-term equity returns at any given point in time.

10-year rolling return (S&P 500)



Source: Bloomberg Finance L.P., Deutsche Bank AG as of 11/30/17

As with a bond, the expected return of a stock can be decomposed into its respective building blocks. After all, being a shareholder in a company gives you a corresponding claim on its future cash flows. The value of a share is the present value of those expected cash flows. As with bonds, expected returns can take the form of dividends paid during the investment period, plus any share-price appreciation in the meantime. However, tomorrow's share price similarly depends on future dividends, as well as price changes thereafter. With a sufficiently long time horizon, the weight of the price component in the calculation tends towards zero. Given that companies can in principle exist forever, it is therefore natural

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to consider the value of stock as simply a function of current dividends, future dividend growth rates and the discount rates investors are applying.

But aren't we forgetting something here? What about share buybacks, an increasingly common way for companies, particularly in the U.S. to return cash to shareholders. Actually, both our own analysis and other studies have found that in the long term, the buyback effect is typically outstripped by the dilution effect from new shares being issued, as Bernstein and Arnott (2003) showed.

This is one of three reasons why in the long run, real earnings per share, out of which dividends are paid, are at most likely to grow in line with gross real domestic product per capita. Another reason is that a lot of economic growth results from new companies, not yet listed; stock investments can participate only in the growth of established businesses. Third, retained earnings are often invested at a rate of return that is below externally available investments. Chief executives have plenty of leeway in how they use company funds, and they may not necessarily be in their shareholders interest.

Historical data and macro-economic estimates help to assess the size of these effects in various regions. In order to compare our results with those for fixed income, we also add an inflation component. This is derived from 10-year inflation swaps for developed markets and forecasts by the International Monetary Fund for emerging ones. Finally, we know from past experience that earnings margins can be highly volatile in any given year, and that in the long run, price-earnings ratios tend to be mean reverting. This is why we use a cyclically adjusted price-to-earnings (CAPE) ratio, popularized by Robert Shiller, to assess the likely valuation changes over a longer-term forecasting horizon.

Our resulting estimate of future returns on a 7-year to 10-year horizon is still well above yields on long-dated government bonds. From a global perspective, equities continue to offer the potential for a substantial positive risk premium. Expected returns for developed markets are relatively tightly clustered. Within emerging markets, Latin America might offer attractive rewards if currently depressed earnings and valuations were to revert back to historic means. Asia excluding Japan appears fairly valued and on track towards fairly substantial earnings growth.

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Long-term expected equity returns (10-year horizon, all indices in local currency)				
	MSCI USA	Developed Market MSCI Europe	MSCI Japan	Emerging Markets MSCI Emerging Markets
Dividend yield	2.0	3.1	1.9	3.0
Real Earnings Growth	2.5	1.2	2.1	2.0
Trend Earnings Growth	3.2	1.0	2.3	1.6
Retained Earnings	1.9	1.4	1.9	2.4
Valuation effect (P/E)	-0.7	-0.1	0.0	0.7
Total real return	3.8	4.2	4.0	5.8
Inflation	2.1	1.5	0.3	3.9
Total nominal return	5.9	5.7	4.3	9.7*

Source: Multi Asset Group, Deutsche Asset Management Investment GmbH as of 11/30/17

* Not adjusted for underlying emerging-market local currency risks

The same methodology can also be applied to listed alternative investments, such as real estate investment trusts (REITs) or infrastructure companies. The return components are the same, only with different weightings. For example, REITs offer high dividend yields (around 4.0%), but almost no retained earnings; for legal reasons, they have to distribute their rental income. The annual resulting return assumptions are 5.8% for global REITs and 6.4% for global infrastructure.

Alternative investment returns

For alternatives, we generally assess future returns by combining statistical analysis and our return projections for the traditional asset classes. For hedge funds, this means using a factor-based model in order to figure out key return drivers. We applied such a model to the database of Hedge Fund Research (HFR), which is the one most commonly used by practitioners. Our findings confirm that returns from different types of hedge-fund strategies vary, depending on broader financial market trends. This is why our return assumptions take into account the broader market context – the market regime, as it is commonly known. For example, periods of financial-market stress tend to be especially painful for certain equity strategies, while macro strategies proved fairly resilient. Based on our calculations, we expect a broad portfolio of hedge funds to generate returns of 2.7% per year over the long term. Another key finding is that there is a great deal of dispersion in returns, depending on both the strategy and the manager selected. Fund structures and fee arrangements also have a big impact. That said, we found that selectively adding hedge-fund investments can help diversify and adjust risk in multi-asset portfolios.

In commodities, we currently expect a return of 3.6% per year in the long term. Investing in commodities means buying futures. This allows you to collect interest at the risk-free rate on the amount of your collateral. On top of that, we merely add our long-term expectations for U.S. inflation. This is a bit of simplification in several ways. On the one hand, our approach ignores the potential of real commodities prices to rise (for example due to growing scarcity) or to fall (due to productivity advances) over long periods of time. Effectively, it amounts to saying that real commodities prices will remain constant in the long run. On the other hand, it also assumes no gain our losses due to the shape of the futures curve. Whenever a futures contract expires, it needs to be replaced with a new one. This typically yields small gains, but can also cause

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substantial losses during periods of commodity-market turmoil. For example, Ilmanen (2011) show the decomposed returns for the S&P GSCI Index since 1969. They found the cumulative gains from 1970 onwards were fully cancelled out by losses from contracts expiring during the late 2000s. For this reason, we take a simplified approach in our long-term strategic asset allocation. For a tactical asset allocation with a shorter time horizon, other methods might be better suited.

For convertibles, we use an average of our equities and credit return assumptions, and adjust for currency hedging costs. Using a simple average appears appropriate, as a balanced strategy for convertibles targets an equity sensitivity around 50%. In total, we estimate the current long-term convertibles bonds return at 4.4%.

Finally, one alternative investment type worth highlighting are U.S. bank loans to highly leveraged companies. Nowadays, such loans tend to be broadly syndicated to a diverse group of institutional investors. The coupons for leveraged loans, unlike most other debt instruments in the U.S., are floating. Moreover, such loans are typically secured by the company's physical assets (property, plant and equipment), resulting in attractive risk-adjusted returns. Our strategic return projection for leveraged loans of 5.4% is based on two transparent building blocks: our short-term U.S. Treasury bills and the long-term average loan spread over 3-month Treasury bills.

Conclusion

In recent years, investors have been forced to take more risk than they might have previously felt comfortable with. The methodological framework underpinning our long-run return assumptions helps explain why. Through quantitative easing (QE), central banks have pushed down yields on long-term government bonds, commonly used as a proxy for a country's risk-free rate. Partly as a result, constructing a portfolio with positive expected returns requires taking a lot more risk today, than in years gone by. In coming months, we plan to follow up on this analysis by providing additional details.

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Glossary

Correlation

Correlation is a measure of how closely two variables move together over time.

Default

Default is the failure to meet the legal obligations of a loan, for example when a corporation or government fails to pay a bond which has reached maturity. A national or sovereign default is the failure or refusal of a government to repay its national debt.

Futures contract

A futures contract is a standardized, contractual agreement to trade a financial instrument or commodity at a pre-determined price in the future.

International Monetary Fund (IMF)

The International Monetary Fund (IMF), created in 1945 and headquartered in Washington, D.C., is an organization of 188 countries, working to foster global monetary cooperation, secure financial stability, facilitate international trade, promote high employment and sustainable economic growth, and reduce poverty around the world.

J.P. Morgan EMBI Global Diversified Composite

The **J.P. Morgan EMBI Global Diversified Composite** comprises dollar-denominated government bonds, issued by select emerging-market countries.

Mean reversion

Mean reversion is a theory that prices and returns eventually move back toward the mean, or average.

Quantitative easing (QE)

Quantitative easing (QE) is an unconventional monetary-policy tool, in which a central bank conducts broad-based asset purchases.

Real Estate Investment Trust (REIT)

Real Estate Investment Trusts (REITs) are companies, mostly listed, that own and often operate various types of real estate. They are obliged to pay out a minimum of 90% of earnings.

Recovery rate

The recovery rate is the extent to which principal and accrued interest on a debt instrument can be recovered in default, expressed as a percentage of the instrument's face value.

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S&P GSCI

The **S&P GSCI** tracks the price development of 24 different commodities as underlyings of futures positions.

Spread

The **spread** is the difference between the quoted rates of return on two different investments, usually of different credit quality.

Treasuries

Treasuries are fixed-interest U.S. government debt securities with different maturities: Treasury bills (1 year maximum), Treasury notes (2 to 10 years), Treasury bonds (20 to 30 years) and Treasury Inflation Protected Securities (TIPS) (5, 10 and 30 years).

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Risk warning

Investments are subject to investment risk, including market fluctuations, regulatory change, possible delays in repayment and loss of income and principal invested. The value of investments can fall as well as rise and you might not get back the amount originally invested at any point in time.

Investments in Foreign Countries – Such investments may be in countries that prove to be politically or economically unstable. Furthermore, in the case of investments in foreign securities or other assets, any fluctuations in currency exchange rates will affect the value of the investments and any restrictions imposed to prevent capital flight may make it difficult or impossible to exchange or repatriate foreign currency.

Foreign Exchange/Currency – Such transactions involve multiple risks, including currency risk and settlement risk. Economic or financial instability, lack of timely or reliable financial information or unfavorable political or legal developments may substantially and permanently alter the conditions, terms, marketability or price of a foreign currency. Profits and losses in transactions in foreign exchange will also be affected by fluctuations in currency where there is a need to convert the product's denomination(s) to another currency. Time zone differences may cause several hours to elapse between a payment being made in one currency and an offsetting payment in another currency. Relevant movements in currencies during the settlement period may seriously erode potential profits or significantly increase any losses.

High Yield Fixed Income Securities – Investing in high yield bonds, which tend to be more volatile than investment grade fixed income securities, is speculative. These bonds are affected by interest rate changes and the creditworthiness of the issuers, and investing in high yield bonds poses additional credit risk, as well as greater risk of default.

Hedge Funds – An investment in hedge funds is speculative and involves a high degree of risk, and is suitable only for “Qualified Purchasers” as defined by the US Investment Company Act of 1940 and “Accredited Investors” as defined in Regulation D of the 1933 Securities Act. No assurance can be given that a hedge fund's investment objective will be achieved, or that investors will receive a return of all or part of their investment.

Commodities – The risk of loss in trading commodities can be substantial. The price of commodities (e.g., raw industrial materials such as gold, copper and aluminium) may be subject to substantial fluctuations over short periods of time and may be affected by unpredicted international monetary and political policies. Additionally, valuations of commodities may be susceptible to such adverse global economic, political or regulatory developments. Prospective investors must independently assess the appropriateness of an investment in commodities in light of their own financial condition and objectives. Not all affiliates

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Investment in real estate may be or become nonperforming after acquisition for a wide variety of reasons. Nonperforming real estate investment may require substantial workout negotiations and/ or restructuring.

Environmental liabilities may pose a risk such that the owner or operator of real property may become liable for the costs of removal or remediation of certain hazardous substances released on, about, under, or in its property. Additionally, to the extent real estate investments are made in foreign countries, such countries may prove to be politically or economically unstable. Finally, exposure to fluctuations in currency exchange rates may affect the value of a real estate investment.

Structured solutions are not suitable for all investors due to potential illiquidity, optionality, time to redemption, and the payoff profile of the strategy. We or our affiliates or persons associated with us or such affiliates may: maintain a long or short position in securities referred to herein, or in related futures or options, purchase or sell, make a market in, or engage in any other transaction involving such securities, and earn brokerage or other compensation. Calculations of returns on the instruments may be linked to a referenced index or interest rate. In such cases, the investments may not be suitable for persons unfamiliar with such index or interest rates, or unwilling or unable to bear the risks associated with the transaction. Products denominated in a currency, other than the investor's home currency, will be subject to changes in exchange rates, which may have an adverse effect on the value, price or income return of the products. These products may not be readily realizable investments and are not traded on any regulated market..

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