



The place of bonds in a low yield world

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Dean is primarily responsible for investment research and process development. In this role, he combines his long and varied fixed income experience with analytical rigour to continually improve our investment processes and product designs to ensure that maximum value is extracted from the available opportunities in fixed income markets. This is to ensure that we continue to deliver the exceptional performance clients have come to expect.

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Executive summary

With the long lasting impact of the Global Financial Crisis (GFC) as well as the structural and demographic headwinds weighing on potential growth, investors are increasingly questioning the continued relevance of bonds. This paper examines if bonds still offer a source of diversification and answers the question of 'what role do bonds have in this new low yield environment?' This paper looks into the drivers behind bond-equity correlations, and examples are provided to show that bonds offer enhanced diversification qualities during times of low growth, low inflation and market uncertainty.

In the years since the GFC, markets around the world have experienced some of the most negative bond-equity price correlations in decades. This bond-equity correlation has resulted in improved risk-adjusted returns for investors with an allocation to bonds and continues to offer opportunities for active investors.

The diversification benefits of bonds can be expected to continue as the global economy struggles to regain momentum, as experienced in Japan since the 1990s. Lower economic growth also results in the flattening of the efficient frontier curve, and as such a portfolio allocation to bonds will provide only a slightly lower return for much less risk, relative to equities.

This paper identifies the added importance of bonds as the world adapts to lower yields. With growth remaining at low levels, investors will continue the chase for yield resulting in heightened market volatility and 'risk-on, risk-off' mentalities forming. However, investors should not be increasing their risk tolerance in this yield seeking environment as an investor's ability to withstand losses declines with yields. Bonds offer a hedge to this added risk and a stable income for risk averse investors, therefore, continuing their relevance as the world adapts to lower investment returns.

Introduction

The benefit of bonds in traditional and modern portfolio management has typically been due to their defensive and diversifying attributes when grouped with a collection of riskier assets such as equities. In a 'normal' interest rate environment, bond prices typically have a low or negative correlation with riskier asset prices. Therefore, a decline in the equity market would be offset in some part by a fall in bond yields and hence an increase in bond prices. Furthermore, bonds have usually been a low risk, income generating investment for investors looking to outperform cash or to take advantage of interest rate changes, in addition to providing liability hedging qualities.

As of November 2016, there had been nearly 700 interest rate cuts from central banks around the world since the collapse of Lehman Brothers in September 2008 (Reuters, 2016). Now, with yields around the world sitting near all-time lows and many central banks maintaining easing biases, the ability of bonds to fall further during periods of volatility may be limited, hence limiting the diversification potential of bonds. Moreover, with the path of interest rates reaching a trough, investors are even questioning if bonds can offer positive returns or returns in excess of cash when rates begin to rise.

Investors around the world are now being faced with this dilemma. Do bonds still maintain their place in a low yield world or should alternative diversification and yield sources be pursued? This paper seeks to determine if bonds remain relevant in a world still recovering from the GFC and how they perform in comparison to when in a 'normal' environment.

Bond-equity correlations – the diversification benefit

The correlations between different asset types form one of the underlying concepts in 'Modern Portfolio Theory'. The bond-equity correlation is an important example of this and has established itself as a primary relationship following the Dotcom Crash of the early 2000s. In such volatile times, when a risk-off sentiment forms, investors generally decrease their equity exposures and move into government bonds. The result is a decline in equity prices and a fall in bond yields (so higher bond prices). However, in an environment of low yields, the ability of bond yields to decline further may come into question. To determine how this important relationship may withstand a low yield environment, it is essential to look at the fundamental drivers of bond yields and the bond-equity correlation.

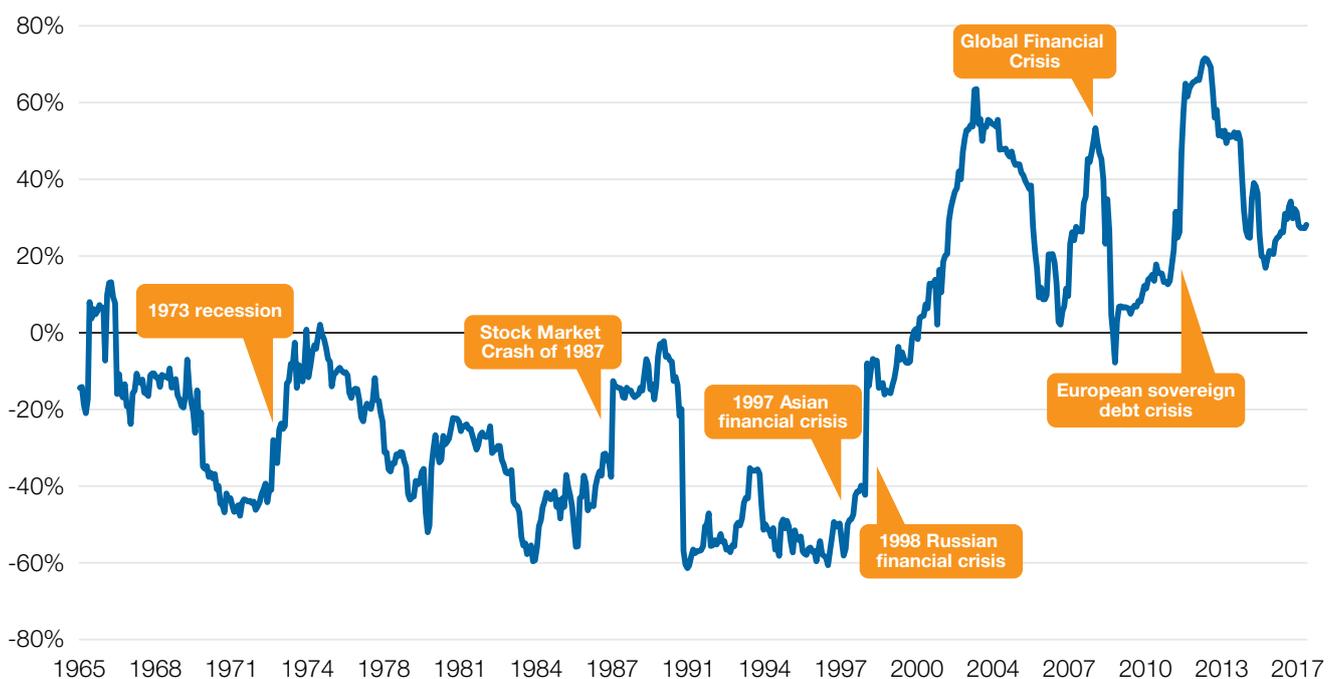
In this paper, the bond-equity correlation is defined as that between bond yields and equity prices. Therefore, the higher the correlation the better the diversification benefits.

Drivers of bond-equity correlations

The bond-equity correlation in the US market, as with many markets around the world, has experienced periods of both significant as well as low correlation over the last century. The US is used here as an example, due to its substantial size, however, as shown later in this paper the same relationships are evident in other markets.

The stronger the correlation between equity prices and bond yields, the better this is for a diversified portfolio – as equity markets decline, bond yields decline which drives bond prices higher (the equivalent of a negative price correlation). A primary driver of this bond-equity correlation over the last century has been shocks to the market which has resulted in increasing uncertainty within the investor community. As shown in Chart 1, the bond-equity correlation has climbed during many of the recent economic downturns. Furthermore, since the recession in the early 2000s, this correlation has largely remained in positive territory with increasing uncertainty and a 'risk-on, risk-off' mentality forming in markets.

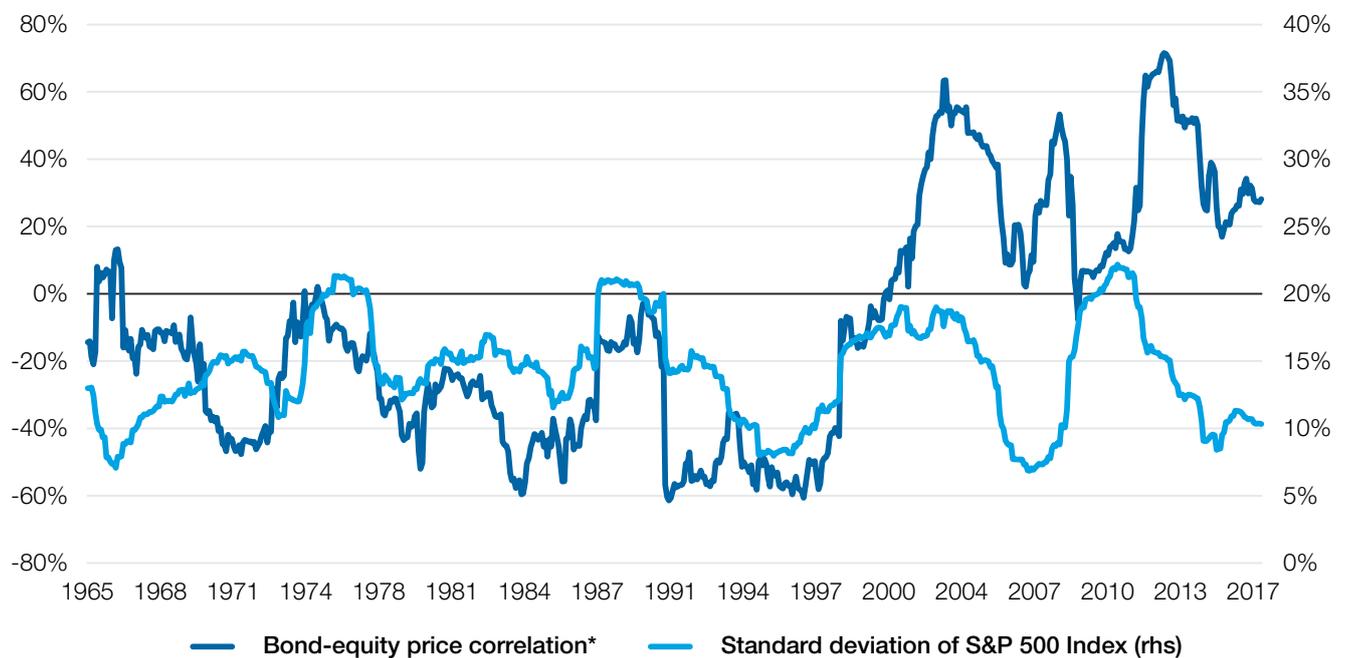
Chart 1: Correlation between equity prices and bond yields (bond-equity price correlation)



Source: Macquarie and Bloomberg (May 2017). Based on the rolling three year correlation of monthly changes in the S&P 500 Index and 10 year US Treasury Bonds.

A similar relationship is shown in Chart 2 when comparing the bond-equity correlation with equity market volatility. During periods of heightened equity market volatility, the correlation has pushed higher. When thinking about this in the context of a diversified portfolio of bonds and equities, as equity prices fall bond yields also decline, hence providing downside protection for investors. Therefore, in a post-crisis environment where investors are increasingly taking on risk in the search for higher returns, volatility in the equity market may further arise, making the case for an extended positive bond-equity correlation.

Chart 2: The bond-equity correlation versus equity market volatility



Source: Macquarie and Bloomberg (May 2017). *Based on the rolling three year correlation of monthly changes in the S&P 500 Index and 10 year US Treasury Bonds.

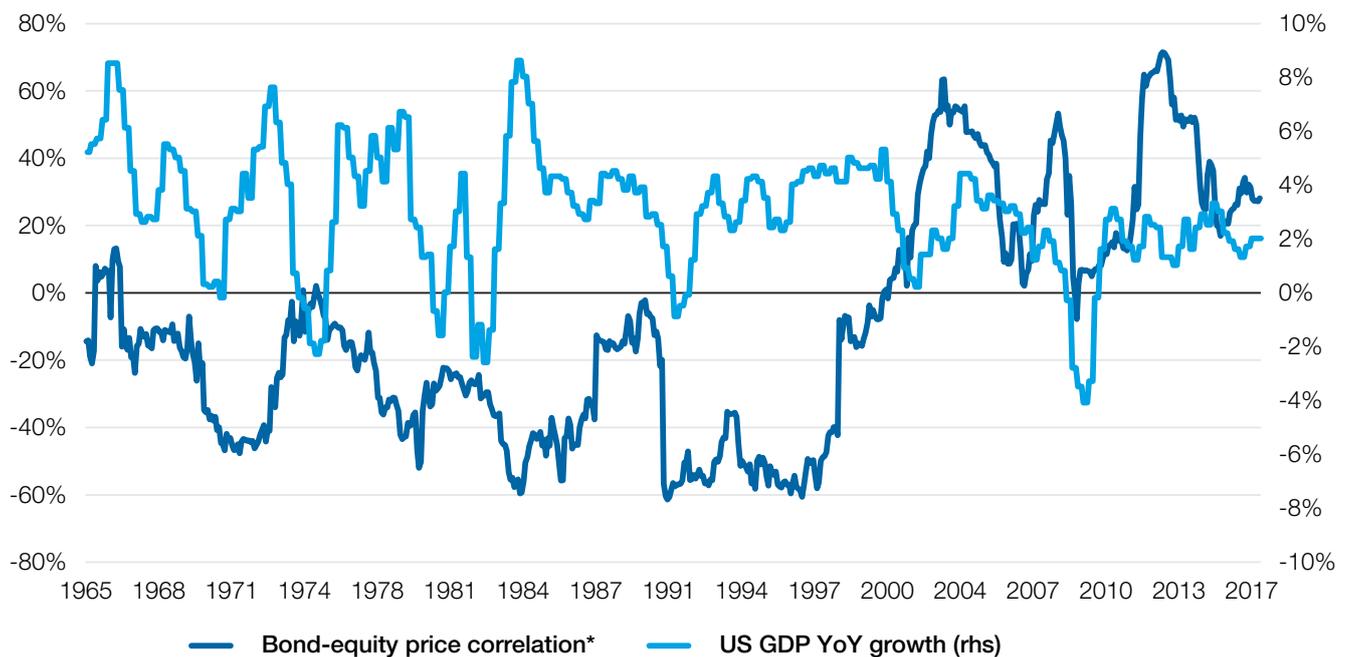
What does a low yield environment mean for bond-equity correlations?

With the lasting impact from the GFC, heightened private debt levels and the impending demographic structural issues, the world economy continues to experience uncertainty. These changes and uncertainties in economic growth also lead to changes in the relationship between bond yields and equity prices.

Impact of a slowdown in economic growth

When economic growth slows, the equity premium decreases as a result of lower earnings potential. Similarly, the lower growth outlook spurs lower term premiums for longer dated bonds. As a result, both equity prices and bond yields fall which sends the bond-equity correlation higher. As shown in Chart 3, during periods of high gross domestic product (GDP) growth, the bond-equity correlation reduces while when GDP growth is low or negative the correlation has trended higher.

Chart 3: The bond-equity correlation versus GDP growth

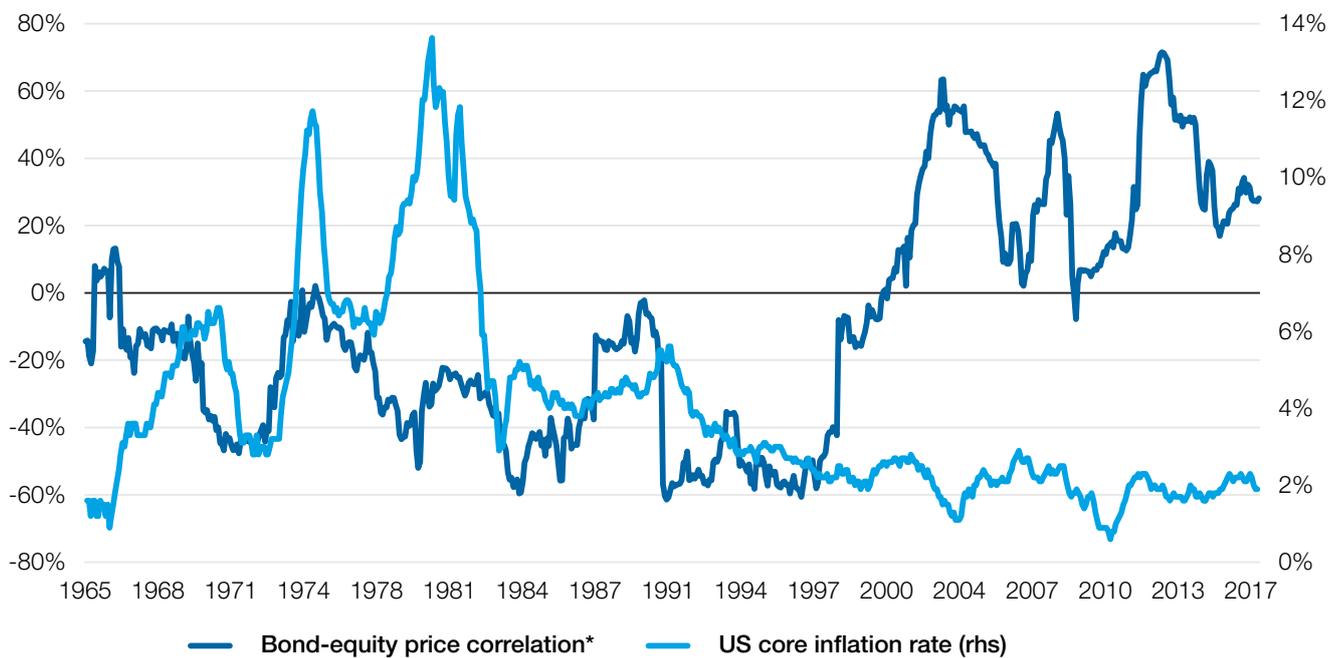


Source: Macquarie and Bloomberg (May 2017).

Impact of lower inflation

A similar observation is found when looking at inflation. During periods of high or volatile inflation, the bond-equity correlation has remained low or negative. As inflation increases, the likelihood of central bank tightening increases and the inflation premium rises. This tightening in monetary policy leads to a decline in equity valuations as equities are discounted at higher rates and similarly leads to a decline in bond prices due to increasing interest rates. This drives the correlation between bond yields and equity prices lower. This relationship has been a strong driver in the correlation over the last century as demonstrated in Chart 4. In recent times, as inflation has remained low and has continued to trend lower, the bond-equity correlation has remained positive for an extended period of time. All else being equal, this correlation would be expected to remain high or positive unless inflation started to experience a modest increase and an aggressive interest rate hiking cycle became a real threat to bonds and equities (Rankin & Muhammed, 2014).

Chart 4: The bond-equity correlation versus inflation



Source: Macquarie and Bloomberg (May 2017).

A look at other markets

While the previous examples have been based around US equity prices and Treasury yields, the same relationships are evident when looking at other markets. The bond-equity correlation in the UK and Australia generally remained negative up until the late 1990s as growth and inflation began (and continued) to stagger. As the economic outlook has also remained uncertain, bonds have continued to be a defensive asset to equities, therefore displaying a continued positive correlation and mirroring the trend observed in the United States (Charts 5-8).

Chart 5: The Australian bond-equity correlation versus inflation

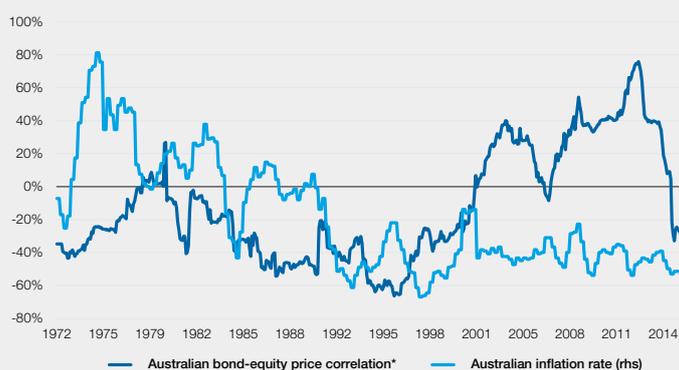


Chart 6: The Australian bond-equity correlation versus GDP

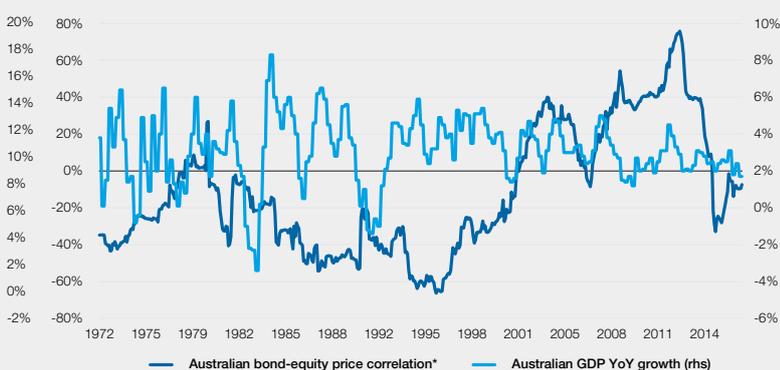


Chart 7: The UK bond-equity correlation versus inflation

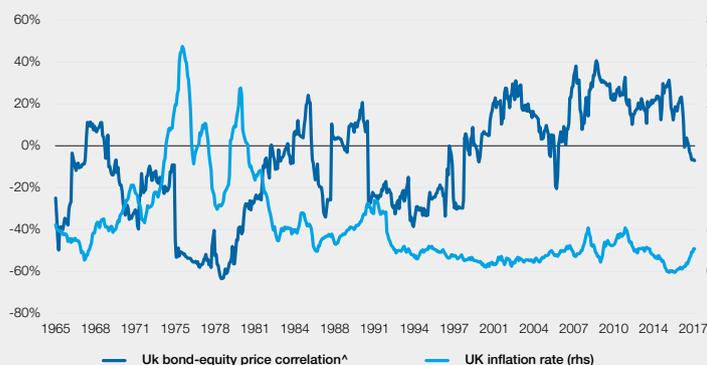


Chart 8: The UK bond-equity correlation versus GDP

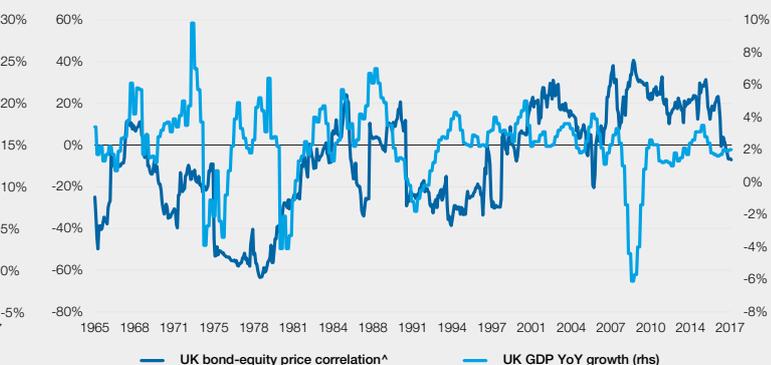


Chart 5: Source: Macquarie, Bloomberg and Thomson Reuters (May 2017). *Based on the rolling three year correlation of monthly changes in the Australian All Ordinaries index and 10 year Australian Commonwealth Government Bond yield changes.

Chart 6: Source: Macquarie and Bloomberg (May 2017). *Based on the rolling three year correlation of monthly changes in the Australian All Ordinaries index and 10 year Australian Commonwealth Government Bond yield changes.

Chart 7: Source: Macquarie, Bloomberg and Thomson Reuters (May 2017). ^Based on the rolling three year correlation of monthly changes in the FTSE All-Share index and 10 year UK gilt yield changes.

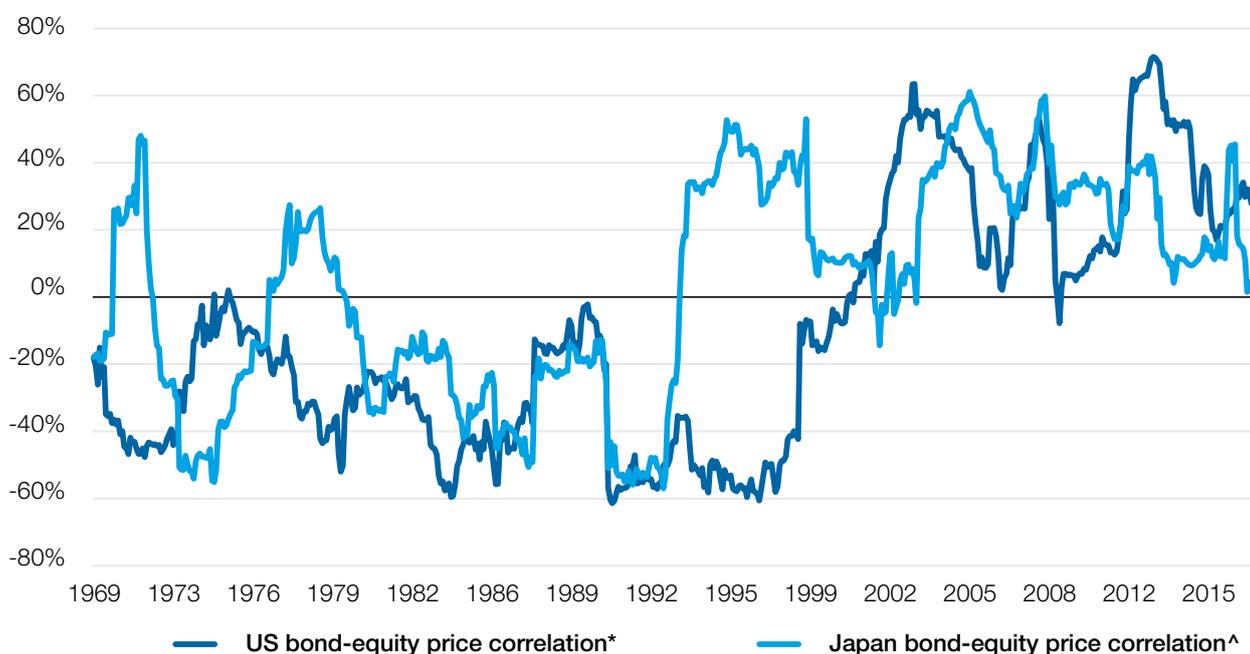
Chart 8: Source: Macquarie, Bloomberg and Thomson Reuters (May 2017). ^Based on the rolling three year correlation of monthly changes in the FTSE All-Share index and 10 year UK gilt yield changes.

Can this continue? Japan as a case study

With interest rates around the world largely remaining at low and contained levels, the sustainability of the recent positive correlations may be questioned. While 10 year bond yields did not fall below 2% in the United States and the United Kingdom until late 2011 and early 2012, and not until 2016 for Australia, Japan's 10 year government bond yield breached the 2% mark in 1997 and it has predominantly stayed below 2% ever since. Japan's unique demographic environment has been a key driver of the country remaining in a prolonged recession with low interest rates, limited growth and no inflation since the mid-1990s (as detailed in our research 'Demographic impacts today'). As a result, the Japanese economy is sometimes viewed as a potential indicator on what a 'lower for longer' world will look like.

During this period of limited growth and inflation, the correlation between Japanese equities and Japanese 10 year government bond yields has primarily remained positive. A comparison between the United States and Japanese correlations can be seen in Chart 9. If the contained and low yield environment continues around the world and economic uncertainty remains a primary concern at the forefront of investors' judgements, the positive correlation may be expected to continue, following a similar route as observed in Japan. As a result, the appeal of government bonds as a protective asset in a low yield world will continue.

Chart 9: US bond-equity correlation versus Japan bond-equity correlation



Relevance of bonds in a diversified portfolio

With the diversification benefit of holding bonds, the 60/40 portfolio (60% equity, 40% bonds) tends to be the starting point for many asset allocation decisions. In a low yield environment however, the ability of bonds to mitigate market risks may be limited by their restrictive low yields. For example, during 2008 when the S&P500 ended the year to close 38% down, yields on US 10 year Treasuries fell 1.8% giving investors in a well-diversified portfolio some relief. With yields in the US sitting around 2-2.5% and even lower around the world, a decline of such magnitude would require yields to be close to 0% or even considerably negative in some cases, diminishing the relative attractiveness of bonds.

On one hand, the positive bond-equity correlation remains at record highs. However, with yields sitting at low levels, it may be difficult for investors to see how bonds can provide a sufficient hedge to equity market declines. Such a unique environment has left investors questioning the practicality of bonds and whether a traditional diversified portfolio, should be replaced with alternative strategies.

Risk-adjusted returns

One way to assess the effectiveness of a diversified portfolio is to use risk-adjusted return measures. One such method is the Sharpe ratio which provides the level of excess return above a risk-free rate per unit of risk, measured using the standard deviation of returns. This approach provides an ex-post measurement of how a diversified portfolio has performed relative to an equity portfolio in the current low-yielding environment.

Chart 10 shows the risk-adjusted performance of a 60/40 portfolio relative to an equity portfolio using the Sharpe ratio. The returns were taken in excess of the local cash rate as the risk-free benchmark rate. As shown across 1, 3 and 5 years, the diversified portfolio has outperformed the equity portfolio when adjusted for the level of risk over each time period and region. This is primarily driven by the positive correlation between bonds yields and equity prices. As expected, bond yields and equity prices are experiencing one of the most positive correlations in recent times implying the returns of bonds and equities are negatively correlated. This negative correlation reduces the volatility within the portfolio. As the equity allocation declines in value, the bond allocation offsets this and vice versa. A combination of the two assets means the portfolio stays within a middle range, never experiencing the volatility that a pure equity portfolio will experience.

Chart 10: Risk-adjusted performance of a 60/40 portfolio versus an equity portfolio (1 year)

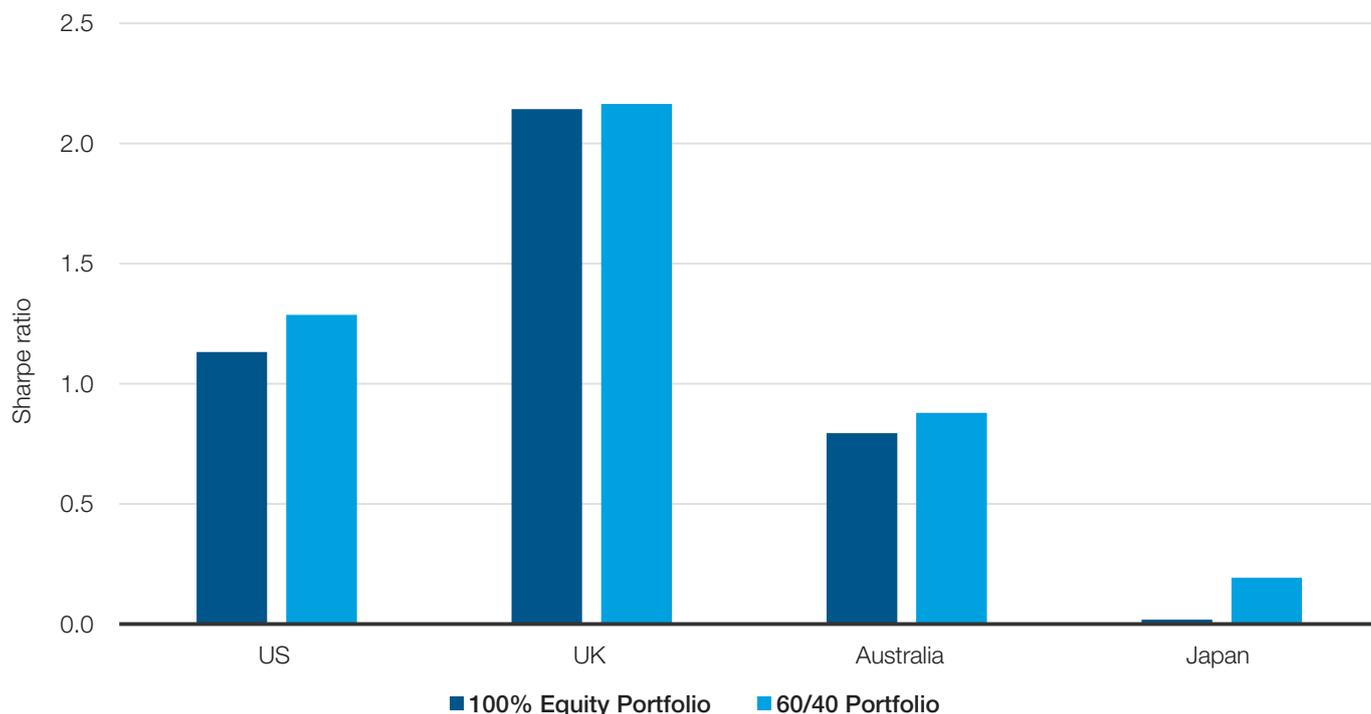


Chart 11: Risk-adjusted performance of a 60/40 portfolio versus an equity portfolio (3 years)

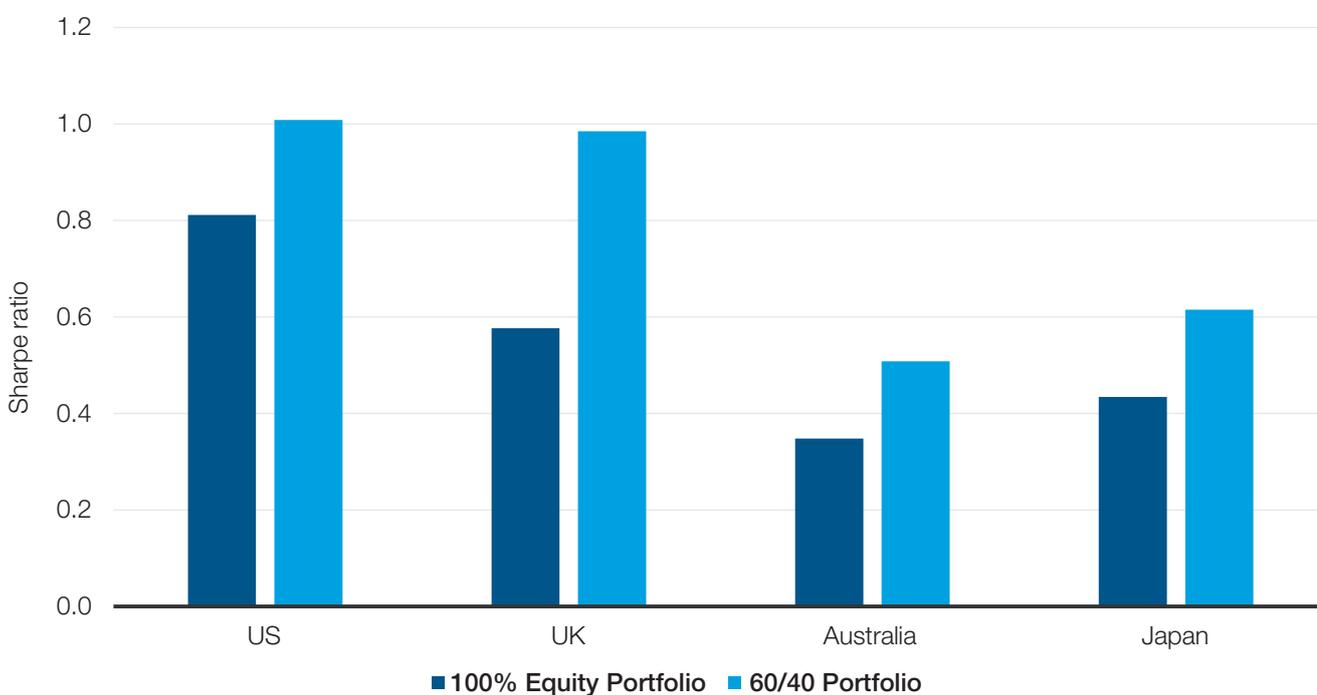
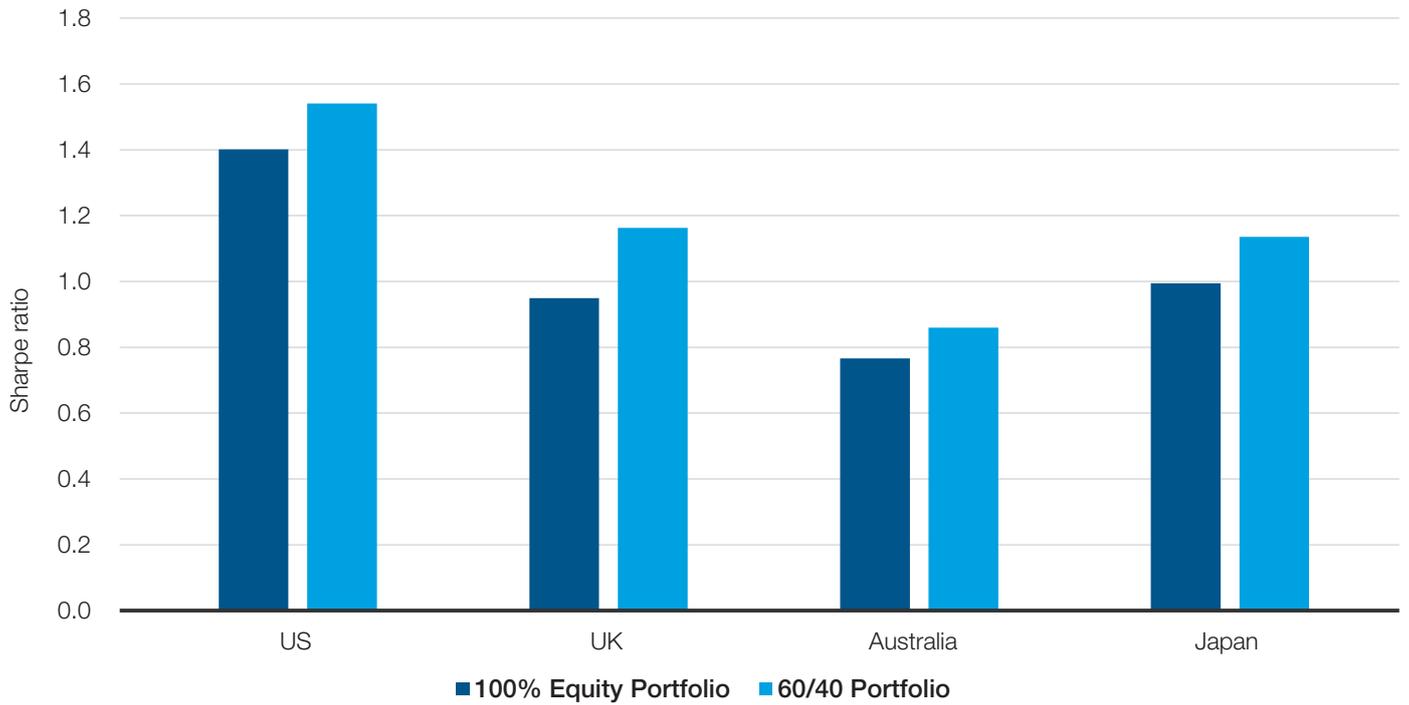


Chart 12: Risk-adjusted performance of a 60/40 portfolio versus an equity portfolio (5 years)



Source: Macquarie and Bloomberg (May 2017). Sharpe ratios of 100% equity index against 60% equity index/40% local bond index, both in excess of cash. US is S&P 500 total return index and Barclays US Treasury index, UK is FTSE All-Share total return index and Barclays Sterling Gilts index, Australia is ASX 200 total return index and Bloomberg AusBond Treasury 0+ Yr index, and Japan is TOPIX total return index and Barclays Japan Government Float Adjusted Bond index. Source: Macquarie, Bloomberg and Barclays (January 2017).

A fundamental approach – the efficient frontier

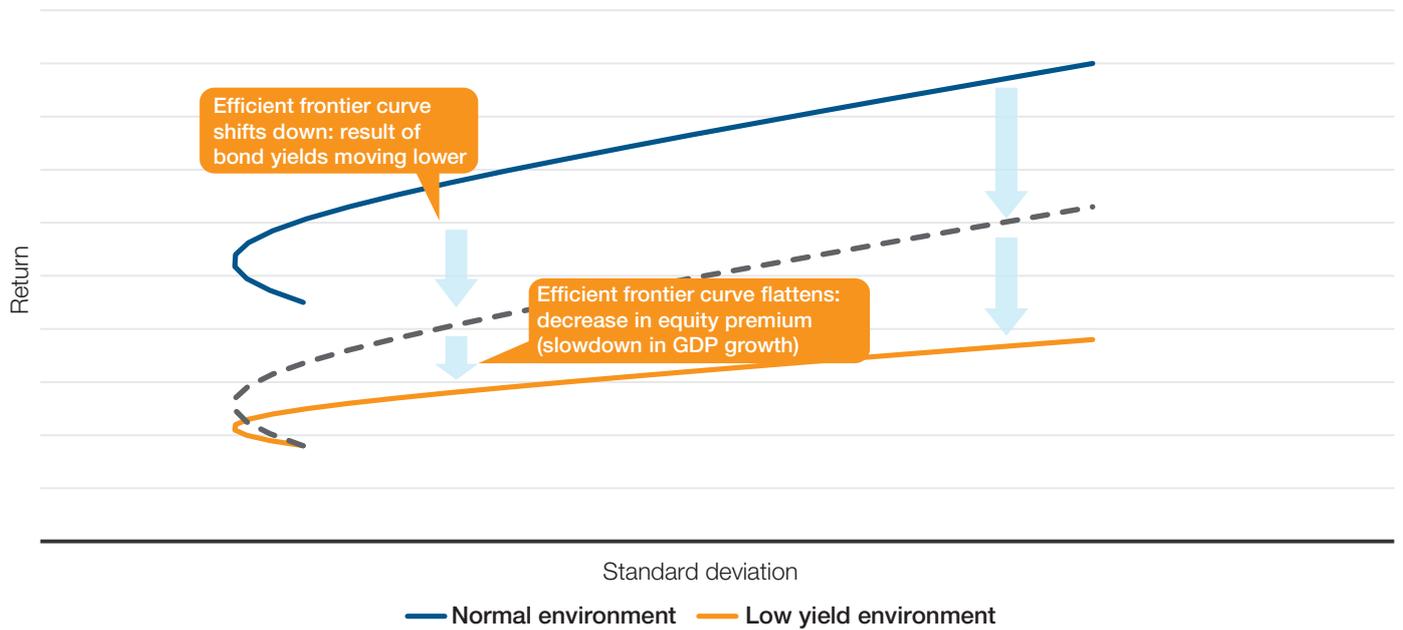
It is clear that bonds have continued to provide a diversification benefit for portfolios since the financial crisis as the world adapted to a low yield environment. However, the difficulty is determining if bonds will continue to provide this benefit.

One ‘forward looking’ method, was provided earlier in this paper, which used Japan as a case study. As Japan has been stuck in this low yield environment since the 1990s, it provides a unique example of what a low growth world may mean for markets such as the US and Australia. The Japanese case study demonstrated the continued benefit of maintaining a bond allocation in an investment portfolio in a low growth world.

Another ‘forward looking’ approach is to go back to fundamentals. One such fundamental for investigating the potential benefit of bonds in a portfolio of risky assets is to look at the efficient frontier curve and how the optimal portfolio may change.

On a conceptual level, consider an efficient frontier curve constructed using bonds and equities for an investor looking to allocate to a combination of the two assets. The level of risk in the model portfolio can be set by adjusting the portion of bonds and equities. As the economic environment changes, the optimal portfolio changes with it. The current environment is largely defined by low growth and low inflation which has resulted in low yields across asset classes. With the decline in yields post the GFC, the efficient frontier has also declined as the previous high returns once available to an investor became unobtainable. This subsequently causes the efficient frontier to shift downwards.

Chart 13: The bond-equity efficient frontier curve (transition from normal to low yield environment)



Source: Macquarie (May 2017).

The lack of economic growth also results in the flattening of the efficient frontier. The aggregate growth of an economy, as measured by GDP growth per capita, represents the sustainable level of growth available to a diversified portfolio of mature companies. Consequently, GDP growth per capita provides an estimate of the equity premium over government bonds. In an environment defined by low growth, the equity premium will also be subdued. This subdued premium limits the outperformance available from increasing risk, therefore flattening the efficient frontier. These moves in the efficient frontier are also demonstrated in Chart 13 which illustrates the impact of a changing economic environment.

The movements in the efficient frontier lead to a number of conclusions:

1. As expected, with low yields resulting in a lower efficient frontier, the world needs to adapt by saving more than required by earlier generations; and
2. As growth stagnates and equity premiums decline, the return for being invested in a risky portfolio declines for any level of risk.

From the point of view of a relatively risk averse investor, such as someone nearing retirement, the risk of chasing yield by increasing their equity allocation is far too great considering the declining premiums and the sustained volatility. The investor’s risk tolerance should not shift upwards. With a lower growth outlook resulting in a flattening efficient frontier, a sizable bond allocation will provide:

- A slightly lower return for not much less risk;
- A stable and uniform income when held to maturity; and
- Will help to preserve capital as the investor retires.

A bond allocation provides sufficient stability for an investor who may not have the time or ability to withstand a 38% drop in their savings as the US equity market experienced in 2008. As such, bonds will continue to provide diversification benefits as the low growth world prevails.

Drawdown protection

Perhaps the most significant benefit of an allocation to bonds in a diversified portfolio is the maximum drawdown protection, relative to a pure equity portfolio. As shown in Table 1, if the equity market declines 20%, should the -30% equity-bond price correlation hold, a 60/40 portfolio would decline by 9.6%, and so the potential loss experienced would decrease by 52%. The protection would be even greater if the bond-equity correlation reached the high experienced during the GFC.

Table 1: The impact of a 20% drop in equity prices on a 60/40 portfolio

Decline in equity prices	Price correlation	Bond price return (using a 10 year bond)	60/40 portfolio return
-20.0%	-30.0%	6.0%	-9.6%

Source: Macquarie 2017.

Liability matching

Another rationale for maintaining a diversified portfolio with bonds is for liability matching. When bonds are added to a portfolio they introduce a source of interest rate risk known as duration. As interest rates rise, bond prices fall and vice versa. This interest rate risk becomes useful for investors or organisations with future liabilities. If the future liability is fixed, the present value of this commitment will vary with interest rates. As interest rates fall, the present value of the liability will increase in the same way a bond's price will.

Therefore, if an investor includes bonds in their portfolio, the bondholder can duration match their liability such that an increase in the present value of the liability will be offset by the capital returns from the bonds held within the portfolio. Without duration risk within an investor's portfolio, the current value of the liability may increase and the investor may not meet the future liability.

A source of liquidity

Allocating a portion of funds to government bonds also provides a stable liquidity source for investors. For core fixed income portfolios containing a significant credit allocation, liquidity risk is vital. Credit securities are often traded over-the-counter rather than on an exchange. Moreover, securities with lower credit ratings or longer maturities may face further liquidity risk. Government bonds, while still often traded over-the-counter, are considerably more liquid than credit securities of similar maturities due to the size of the market and their relative risk-free status.

The size of the US Treasury market alone at \$US13.4 trillion is a significant benefit for investors compared to the US corporate debt market of \$US8.4 trillion (SIFMA, 2016). Further liquidity is also provided through government bond future contracts which are actively traded on an exchange and are considerably more liquid than the underlying physical assets.

Whether bonds are used as a defensive asset to increase risk-adjusted returns, a source of protection against downside risks, a means for liability matching, or as a source of liquidity, the evidence supporting the continued allocation to bonds in a low yield environment remains. Nevertheless, concerns about the ongoing ability of bonds to offer attractive returns remain and need to be addressed.

Absolute returns from bonds

So far this paper has focused on the diversification and defensive benefits that bonds provide, yet bonds have also traditionally provided an attractive source of returns for active managers and investors seeking positive absolute returns. With the world adapting to lower yields, investors are increasingly assessing if bonds continue to have a place in active strategies or if they still have the ability to outperform cash.

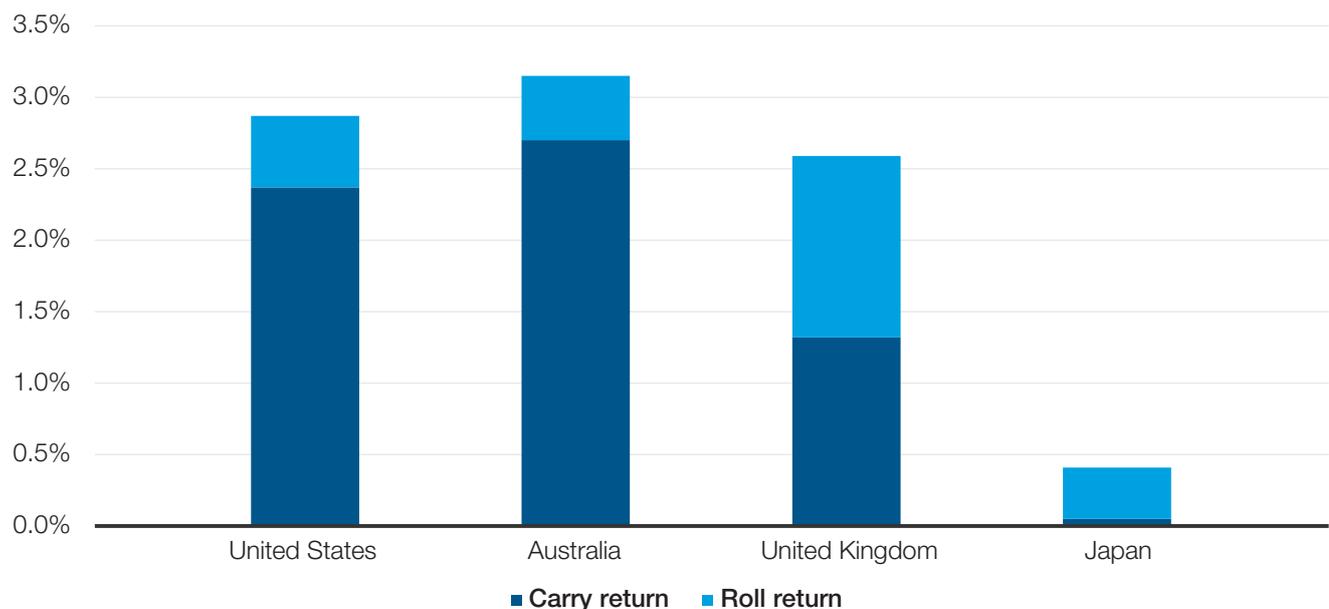
Potential returns – rolling down the yield curve

One growing reservation of active investment managers towards investing in bonds in a low interest rate economy is their general lack of yield relative to cash and other asset classes. However, many investors underestimate the potential returns from bonds by only considering the yield to maturity. This measurement often underestimates the return if the investor intends to sell the bond prior to maturity and the yield curve is upward sloping. This additional return comes from a generally misunderstood concept known as the 'roll' return. If an investor buys a 10 year bond and holds it for a year, it becomes a 9 year bond. As the maturity of the bond decreases, the yield on the bond usually decreases alongside it as a result of the falling duration risk. This decrease in yield is achieved by an increase in the bond's price which results in a return greater than the yield to maturity. The 1 year carry and roll returns for different 10 year government bonds are assessed in Table 2 and in Chart 14, assuming no change to the yield curve over the year.

Table 2: Potential carry and roll returns

Potential return	Carry return	Roll return	Total return (local currency)	Cash return
United States	2.37%	0.50%	2.87%	0.75%
Australia	2.70%	0.45%	3.15%	1.50%
United Kingdom	1.32%	1.27%	2.59%	0.25%
Japan	0.05%	0.36%	0.41%	-0.10%

Chart 14: Potential carry and roll returns



Source: Macquarie and Bloomberg (January 2017). Returns assume no change in the yield curve against the local cash rate.

As shown in Chart 14, the roll return makes up a significant portion of the total return over 1 year and can become even more prominent at steeper parts of the yield curve. The importance of the roll is most obvious when looking at the 10 year gilt. The recent 14bps yield differential between the 9 year and 10 year gilts provides a roll return of 1.27% when multiplied by the duration of the 9 year gilt. This additional return makes up nearly half of the total return and results in a 2.34% excess over the cash rate. Of course, while providing attractive returns with no curve movement, it also exposes the investor to interest rate risk. For a bond manager actively adjusting duration risk based on the direction of interest rates, bonds continue to offer attractive returns over cash when the shape and steepness of the yield curve is considered in investment decisions. Moreover, with total returns up around nominal GDP, bonds continue to be an attractive asset for investors seeking absolute returns.

Returns during a rising interest rate environment

Another reservation often expressed about investing in bonds is their sensitivity to changes in interest rates. When interest rates rise, the decline in bond prices could be enough to offset the carry return, resulting in a negative absolute return. As yields continue to fall, the room for further interest rate cuts decreases, leaving bond investors with diminished upside. However, what investors also need to consider is the impact that changes in interest rates have on equities. While investors do not often consider equities as having duration risk, they essentially do. An equity security's price is calculated by discounting all future earnings by a rate which incorporates current interest rates. As interest rates rise, the discount rate increases which results in a lower price. While determining the price impact for equities is difficult and variable, the impact on bonds can easily be calculated. Calculating this impact provides an assessment of just how significant this risk is relative to the benefits of holding bonds.

With an extended low yield environment becoming consensus in many countries around the world, the likelihood of near-term cash rate hikes in many regions remains improbable. For the few central banks exploring the possibility of raising cash rates, the path looks to be gradual with near term interest rate hikes already priced in. However, it is still important to consider the impact that a surprise 25bps hike may have on bond holdings. Table 3 provides a 1 year impact assessment using recent 10 year government bond rates and assuming the surprise hike occurs at the end of the year.

Table 3: Impact of a surprise 25bps rate hike

Potential return	Carry return	Roll return	Hike return	Total return (local currency)
United States	2.37%	0.50%	2.87%	0.75%
Australia	2.70%	0.45%	3.15%	1.50%
United Kingdom	1.32%	1.27%	2.59%	0.25%
Japan	0.05%	0.36%	0.41%	-0.10%

Source: Macquarie and Bloomberg (January 2017). Calculated based on the impact of a surprise 25bps interest rate hike on current 10 year government bonds if the rate hike occurs at the end of the year.

As shown in Table 3, the impact of a single rate hike on the total return of bonds is minimal in the context of the protection they are providing, with only the 10 year Japan government bond resulting in a negative total return. When comparing this to equities, the nature of the tightening in monetary policy is important. If the tightening is driven by growth, the increase in potential earnings may be enough to offset the rising discount rates. If the trigger is higher inflation, the increasing discount rates could even result in equities underperforming bonds. Therefore, when thinking about the downside of bonds during tightening monetary policy, investors must also consider the potential impact to equities.

Whether it is an active manager navigating interest rate movements or a passive investor looking for diversification, it is evident that the largest threat to bonds, that is, a hike in the cash rate, is minor in the greater context and should be of little deterrence when allocating a portfolio. With total returns up around nominal GDP in each region, bonds continue to be an attractive source of absolute return and not just an asset for defensive allocations.

Conclusions

This paper has looked at the many defining benefits of bonds in a world adapting to low yields and the following conclusions can be made:

- Bonds now face some of the most negative price correlations with equities in recent history, improving the diversification benefit bonds offer.
- Diversified portfolios with both bonds and equities have continued to outperform equity indices on a risk-adjusted return basis over recent years. This has also been the case in Japan which has been in a low yield environment since the mid-to-late 1990s.
- In this new environment, bonds will continue to aid and assist in liability matching and providing liquidity to portfolios.
- Both passive and active investors continue to have opportunities to generate positive returns and outperform cash using bonds.

When looking at bonds post the GFC, they have performed exactly as they are supposed to. Bonds have protected investors from downside risks, minimised portfolio variance during volatile times and remained a safe haven asset for risk averse investors. If central banks are to suddenly pursue a hiking cycle, the path of such interest rate hikes from here are likely be slow and drawn out, resulting in minimal or slow downside risks for bonds. If investors truly face an extended low yield environment as being forecasted by many portfolio managers, then bonds will continue to offer opportunities as they have done in Japan. Additionally, lower aggregate growth implies equity returns will continue to decline alongside bond yields.

Investors should not be increasing risk tolerances and decreasing bond allocations in the chase for yield. An investor's ability to absorb losses declines as yields fall and the world must adapt to lower investment returns and higher savings rates as the new normal. As such, bonds will continue to remain a relevant asset class for investors in both a low yield and normal environment.

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