The equity-bond correlation
– The most important number you rarely think about

September 2014
Summary

- The equity-bond correlation is a vital assumption in any modelling exercise as it drives how risky portfolios are assumed to be. For liability-sensitive investors it matters even more as it describes how assets and liabilities will move relative to each other.

- Correlations vary significantly over time, a feature captured in our modelling. We model correlations dynamically to capture both the range of outcomes they can take and that they vary over time.

- After being predominantly positive for the previous three decades, the equity-bond correlation has been largely negative since the late 1990s but has episodically turned positive, including during last year’s taper tantrum.

- The strength of the economic cycle and risk-on risk-off environment have been major drivers of a negative equity-bond correlation.

- Equities and bonds are more likely to be positively correlated when inflation and/or bond yields are very high, neither of which are a major near term risk. Importantly, rising bond yields do not necessarily present a problem for equity markets when yields are low.

- However, both equities and bonds have benefited from central bank support in recent years and both are vulnerable to a setback when this is removed, especially given lofty valuations.

- Although we recognize the risk of declines in both markets over short time horizons, we assume that equity and bond returns will be slightly negatively correlated in the long run. The business cycle is assumed to remain a dominant driver of markets, which remain vulnerable to booms and busts. This is also based on the assumption that both inflation and bond yields remain relatively well contained.

- While this should benefit well diversified asset-only investors, liability-sensitive investors with large equity weightings should prepare for continued volatility in their funding levels. Appropriate structures should be put in place to minimize this volatility where possible, such as liability hedging programs and de-risking glide paths.
The word “correlation” can cause eyes to glaze over or even some to break out in a cold sweat at the prospect of diving into the statistical lexicon. But this matters. A lot. How much you expect equities to return may seem as sexy as assumptions can get but the correlation between equities and government bonds is one of the most important numbers investors should focus on so perseverance is key. In an asset-liability modelling exercise one could go so far as to say this is the most important assumption.

**Correlations impact the riskiness of a portfolio**

In simple terms, correlation tells you whether, on average, two assets are going up and down at the same time as one another or whether one tends to rise when the other is falling. Consider a two-asset portfolio, equally invested in equities and government bonds. When equities and bonds are positively correlated, this means that a decline in equity markets is normally accompanied by a decline in bond prices (and a rise in bond yields as the price of a bond is inversely related to its yield). Importantly, this is not the same as saying that the decline in equities causes or is caused by the decline in bond prices – correlation does not prove causation. With both asset classes falling, our two-asset portfolio would fare particularly badly, but would also do particularly well if both markets were rising at the same time. If we think about the opposite scenario, where equities and bonds are negatively correlated, then falls in one asset class would be at least partially offset by gains in the other, leading to a smoother return profile. So, a portfolio of two negatively correlated assets will be less risky/volatile than if the assets are positively correlated – this is a key objective of portfolio diversification and why it is so important to understand correlations.

**And liability-sensitive investors have additional headaches to contend with**

The picture gets more complicated when the analysis shifts to considering investors with liabilities whose values are linked to interest rates, such as defined benefit pension plans. For these investors, their liabilities behave like bonds so increase in value when bonds perform well (when bond yields fall). A worst case scenario is their assets falling at the same time that their liabilities are rising. Taking our equally-weighted two-asset portfolio and assuming that equities have a volatility of 19% and long duration government bonds have a volatility of 11%, the simple example in the table below shows that a riskier environment for a defined benefit pension plan is one where equities and bonds are negatively correlated (volatility of pension plan funding position increases in this instance). This is the exact opposite as for an asset-only investor with no liability matching requirements!

<table>
<thead>
<tr>
<th>Correlation</th>
<th>Annual Portfolio</th>
<th>Proxy for Volatility of</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>return Volatility</td>
<td>Pension Plan Funding</td>
</tr>
<tr>
<td></td>
<td>(%)</td>
<td>Position</td>
</tr>
<tr>
<td>-0.2</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>0.0</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>+0.2</td>
<td>12</td>
<td>10</td>
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**Correlations vary dramatically over time**

Over the very long run (since 1871), the correlation between US equities and US government bonds has been close to 0 (bond price returns have been proxied using bond yield data), suggesting that their return profiles have no relationship with each other whatsoever. However, this single figure only tells you about long term average behavior and masks significant variation in the relationship over time, as Chart 1 shows. This variability over time presents a major challenge when setting correlation assumptions since the relationship between these assets

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**Chart 1: Equity-bond correlation (1871-)**

Source: Robert J. Shiller, Aon Hewitt
varies as they are influenced by the changing economic and financial market environment. While this article concentrates on the US market for data availability reasons, similar trends have been seen in other major markets over recent decades, including the UK, Europe ex UK and Canada.

**What influences this relationship?**

**Level of bond yields and inflation**

Charts 2 and 3 show that there is more likely to be a positive equity-bond correlation when bond yields and/or inflation are high (often these occur at the same time). In the US market, the correlation has almost always been positive when either:

- yields have been above 6%
- inflation has been above around 4% post-1950

When yields are high, further increases in yields are therefore generally associated with falling equity markets alongside falling bond prices, a positive equity-bond correlation.

In addition, both equities and bonds struggle when inflation moves to high levels. High inflation is clearly bad for fixed interest bonds as it erodes the real value of their future income (e.g. a 3% bond yield would be highly unattractive if inflation was 6%). Equities cope with moderate inflation but also struggle when inflation is high as companies struggle to pass their increased costs on to consumers, negatively impacting profitability. Conversely, when inflation falls back from high levels, companies tend not to pass all of the benefit of the fall in their costs on to consumers, providing a boost to profitability and equity markets. Fixed interest bonds also perform well in this environment.

Inflation spikes are also bad for equities as they can lead to increased volatility and/or economic uncertainty. For example, US inflation spiked from around 3% in mid-1972 to above 12% by the end of 1974. Equity markets crashed 40% and bonds also sold off, yields rising from 6% towards 8%. High and volatile inflation during the 1970s and 1980s helps explain the strongly positive equity-bond correlation shown in Chart 1 over this period. Similarly, as inflation was brought under control, equity markets rose and bond yields fell – the start of a 30 year bull run in bonds.

While it is true that high inflation and/or bond yields are consistent with a positive equity-bond correlation, the opposite is not necessarily true. As Charts 2 and 3 show, a low level of inflation and/or yields can be associated with either positive or negative equity-bond correlations. Importantly given the current market environment, as Chart 4 shows, when yield levels are below 6% there does not appear to be any obvious relationship between the direction of yield movements (higher or lower) and the equity-bond correlation. Rising yields therefore do not necessarily present a problem for equity markets when yields are below 6%.

**Chart 2: Correlation vs bond yields**

(1871-)

![Chart 2: Correlation vs bond yields](image)

Source: Robert J. Shiller, Aon Hewitt

**Chart 3: Correlation vs inflation (1950-)**

![Chart 3: Correlation vs inflation (1950-)](image)

Source: Robert J. Shiller, Aon Hewitt

So why does this happen? Rising yields lead to falling bond prices. In addition, when yields are high it becomes very expensive for companies to borrow money and this negatively impacts their ability to grow profits.

**Chart 4: Rising yields not necessarily a problem for equities when yields are below 6% (1871-)**

![Chart 4: Rising yields not necessarily a problem for equities when yields are below 6%](image)

Source: Thomson Reuters Datastream, Aon Hewitt
International comparisons support similar conclusions. For example, in the UK, yields above 5.5% or inflation above 5% have predominantly been associated with a positive relationship between equities and bond price movements. In Japan’s case, we can go even further. There, not only have higher yields been more associated with a positive equity-bond correlation but unlike in the US market, the opposite has also been true. Since yields fell below 6% in the early 1990s, the equity-bond correlation has been almost exclusively negative.

In summary, while times of high inflation and/or yields give a strong steer as to how equities and bonds are likely to perform relative to each other, these indicators are less useful when at moderate or low levels. Other factors often dominate in these instances.

The economic cycle
In an economic downturn, equities fall out of favor and demand for safe haven government bonds picks up, leading to a negative equity-bond correlation. The opposite is also true and in periods of optimism, equity markets rise as demand for safe haven bonds falls back. This is the story of events since the late 1990s. Irrational exuberance towards the end of the Dotcom boom saw investors pour money into equities and shun bonds whereas the bust which followed saw a complete reversal. This pattern has continued throughout this millennium, driving the predominantly negative equity-bond correlation shown in Chart 1 over this period. This represents a regime shift from the positive correlation seen for most of the previous 30 years. More recent experience has been particularly extreme due to the risk-on risk-off nature of markets since the financial crisis. Liability-sensitive investors with large equity exposures have been hurt the most by this change. Their assets and liabilities have been out of sync as equities and bonds have moved in opposite directions.

Valuations
In the early 1980s, US long bond yields rose above 15% and the cyclically-adjusted price earnings ratio fell close to a 100 year low. Both asset classes were cheap and this ushered in a period where both performed well simultaneously, driving a strongly positive correlation between equities and bonds. Conversely, when either equities or bonds are expensive, they are more susceptible to a period of poorer performance. When both are expensive at the same time, then the chances of them suffering disappointing performance alongside each other increases. The likelihood of returns becoming positively correlated as both markets sell off is amplified.

Recent performance
As Chart 1 shows, equities and bonds have been negatively correlated for some time on a rolling 24 month basis. However, both equities and bonds simultaneously endured significant sell offs last summer and returns turned positively correlated as Chart 7 shows. This was sparked by comments from Ben Bernanke, then Chairman of the Federal Open Market Committee (FOMC), that the Federal Reserve was ready to consider tapering its quantitative easing program. Markets were spooked by this unexpected announcement and took fright that monetary policy could be tightened sooner than previously anticipated. As both equities and bonds benefited from central bank support in recent years, the threat of tighter monetary policy sent shock waves through both asset classes – both fell in value as performance turned positively correlated for a short while. Given the globally integrated nature of financial markets, this effect was felt across other major markets as equity and bond markets tumbled worldwide.
What does the future look like?

We believe that it is reasonable to assume the correlation between equity and bond returns will be slightly negative over the next 10 years. This assumes a continuation of post-1998 experience where the business cycle remains a dominant driver and markets remain vulnerable to booms and busts. This also assumes that inflation does not rise sustainably above 4% and bond yields remain below 6%, both of which appear quite reasonable assumptions given central bank stances. Asset-only investors should take comfort that a well balanced portfolio of equities and bonds should yield diversification benefits in the long run. However, liability-sensitive investors with large equity allocations should not expect any respite from continued volatility between their assets and liabilities. Appropriate structures should be put in place to minimize this volatility where possible, such as liability hedging programs and de-risking glide paths.

While we think our assumption is reasonable as a long run average, we recognize the uncertainty around this, particularly over shorter time horizons, and so should everyone else. As discussed above, last year’s ‘taper tantrum’ saw both equities and bonds sell off simultaneously. The chances of a policy mis-step are high as central banks step back from the greatest monetary policy experiment ever conducted. Quantitative easing (direct purchases of bonds) is shifting to qualitative easing (loosely defined forward guidance) and the scope for markets to misinterpret central bank intentions is clear. Given that both equity and bond markets have benefitted from central bank support in recent years, both are vulnerable to a setback when this support is removed. This is particularly true given that both equities and bonds are expensively valued at present. Should valuations revert to more normal levels, both are at risk of falling in value.

Therefore, while we assume that equities and bonds will remain negatively correlated in the long run, it is important to recognize the risk of declines in both markets over shorter time horizons.

How do we capture this variability?

One way we capture this in our modelling work is to assume that correlations are not constant but vary across a distribution of values, some of which are more likely than others. Although we publish a correlation matrix, this is a simplification and should be thought of as a representative matrix of average correlations rather than static values which are assumed to hold in all situations.

In practice and in our modelling, these correlations vary depending on the economic environment. For example, when equity markets crash, you normally find that other risky asset classes crash too, even if their performance is not normally so closely related. In other words, risky assets tend to become more highly correlated with one another when markets suffer a major downturn. This is an observable and important feature of markets and one which must be captured for any asset or asset-liability modelling to stand up to scrutiny.

By capturing not just how assets can be expected to perform in the long run but also how they could behave over shorter time horizons, our modelling allows rich analysis of the range of possible outcomes, thereby enabling more effective decision making.
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