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Beyond the madding crowd

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Asset allocation in pictures
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Multi-asset research

# Beyond the madding crowd

Asset allocation in pictures

Based partly on global data but mainly on US data since 1914, we have developed some simple asset allocation rules. The simplest rule is to stick with equities, except when they fall (easier said than done!). Aside from events such as war, equities follow the economic cycle (no surprise there). We have developed an equity bear market indicator that has moved beyond neutral but is not yet critical. We believe it is too early to move away from cyclical assets but, when the time comes, we expect high-yield credit to weaken first.

Our main conclusions are:

- The results of any historical analysis are dependent upon the start and end-points. Decisions based on global data since 1998 push us to favour gold and to ignore stocks, government debt and broad commodities (CTY).
- Going further back forces us to rely on US data and the results are more as expected (cash dominates low volatility optimal portfolios; stocks dominate higher volatility solutions; investment-grade credit (IG), government debt and real estate provide ballast in the middle volatility areas). High-yield credit (HY) plays no role.
- Gold and commodities are well inside the efficient frontier and would not appear in optimal portfolios were it not for their low correlation with other assets. This diversification characteristic permits them a small role.
- Stocks have provided the best returns over the long haul, with a 5% risk premium versus government debt since 1914. They have been the best performing asset in 45% of years and the #1 or #2 asset 60% of the time. However, they also produce negative returns in one out of every four years (one in three if we use real returns).
- To avoid those negative years, it would be useful to know when war or recession was about to occur. Short of being able to do that we have developed our own US equity bear market indicator (based on the yield curve, earnings yield gap, Shiller PE and EPS momentum). The current reading is 64%, which is above neutral (50%) but not yet dangerous, in our opinion (the maximum is 100%). The only component that is flashing "danger" is the Shiller PE but history suggests that alone is neither a necessary nor a sufficient condition for a bear market.
- Our analysis of how each asset class performs at each stage of the cycle is summarised in **Figure 1**. We believe the US economy is in the "late-expansion" phase and that many other regions are in the "early" or mid-expansion" phases. On this basis, we prefer to stick with cyclical assets, especially stocks and real estate. The analysis also suggests that HY cracks first when the downturn comes, so we will keep an eye on that asset class.

Figure 1 – The asset allocation roller coaster (with preferred assets in blue)
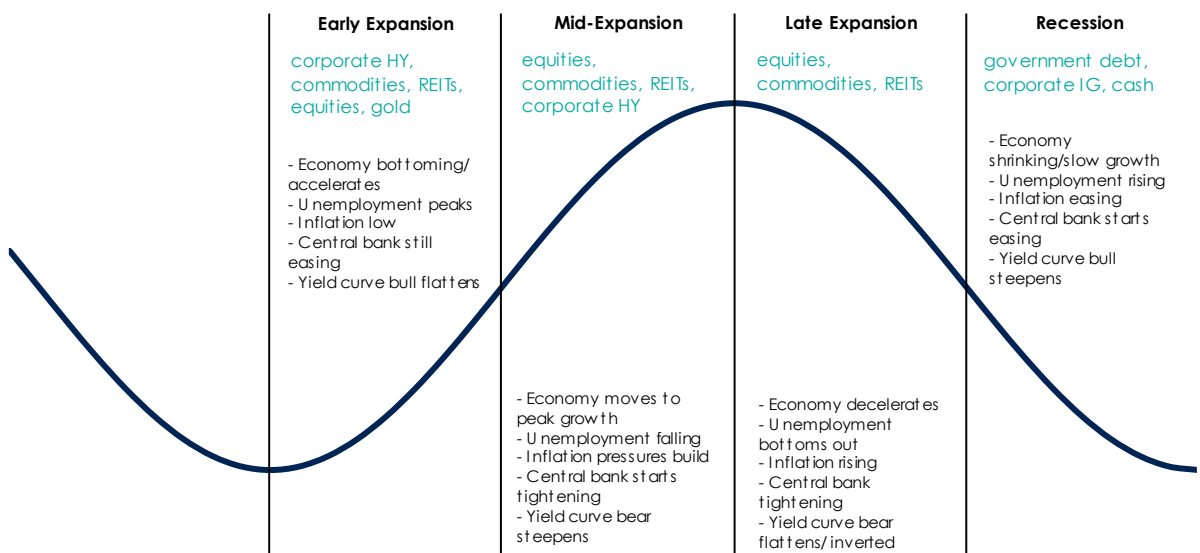
Source: Invesco PowerShares Research.

Summary and conclusions

This document consists mainly of charts, which we use to explore asset allocation from many different angles. The aim is to develop simple investment rules. Though we start with global asset classes, data limitations forced us to fall back upon the US, which allows us to stretch the analysis back to 1914 for six asset classes. In all cases, the analysis is based upon inflation adjusted total returns. Our conclusion, based partly upon a new equity bear market indicator, is that it is too early to move from cyclical to defensive assets.

The strange attraction of gold

The first conclusion is the importance of start and end-dates. The analysis of global asset classes gives the surprising result that gold should have been the favoured asset for risk-seeking investors over the period considered. This is because the data history started in 1998, when gold was at a low ebb and about to start on a decade-long bull run. This is the exception, rather than the rule, over longer historical periods. Anybody starting their investment career in 2002 could be forgiven for believing that gold is the answer to all their prayers.

Though the analysis of global assets extended to eight categories, only five featured in the optimal portfolios that described the efficient frontier: gold, real estate investment trusts (REITS), IG, HY and cash. There would have been no role for stocks, commodities (CTY) or government debt (govt), all of which were inside, rather than on, the efficient frontier. Note that we treat gold separately to "commodities" as we believe it plays a unique role in investment portfolios (though it does appear in broad commodity indices).

US assets since 1987 – that's more like it

Unfortunately, if we want to use longer data histories, we are obliged to limit the analysis to the US market. This allows us to broaden the analysis by adding another asset class (small-cap equities, represented by the S&P SC 600) and by extending the time frame back to 1987 (as far back as we could go for the high-yield category).

The analysis of this 30-year period reveals what we consider to be a more normal outcome (see **Figure 2**). In this instance, gold and commodities are well inside the efficient frontier: that they appear at all in "efficient frontier" optimal portfolios is due to their low correlation with other assets. Gold, for example, has been roughly as volatile as HY but with much lower returns. However, HY does not appear in those optimal portfolios whereas gold does due to its negative correlation with other assets. Put simply, HY returns can be replicated with lower volatility by using a combination of other assets (S&P 500, REITS and the merest hint of government debt). Note that we use the S&P 500 index as a proxy for large-cap stocks.

Another interesting contrast is between government debt and IG credit: they have produced similar returns with a similar degree of volatility but the former plays a more important role in optimal portfolios because it has been less correlated with other assets (and therefore offers better diversification).

Finally, the addition of small-cap equities to the framework adds very little over-and-above what large-caps offer. Though the two are close together in risk-return space (and have similar correlation with other assets), the S&P 500 is on the efficient frontier whereas the S&P SC 600 is not.

Optimal portfolios are dominated by the large-cap stocks, REITS and government debt, except when low volatility is sought (then cash, gold, commodities and small-cap stocks become more important). Again, it is worth pointing out that HY does not appear in any of the optimal portfolios, irrespective of risk tolerance.

Figure 2 – The efficient frontier for US assets (1987-2016)
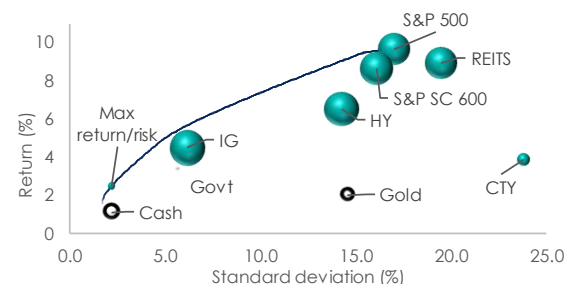
Based on calendar year CPI-adjusted total returns (1987-2016 inclusive). The size of the bubble is in proportion to the average correlation with other assets (cash and gold correlations are negative, that for govt debt is close to zero). Source: BofAML, GPR, JP Morgan, S&P GSCI, Datastream and Invesco PowerShares Research (see Data Appendix).

Extending the time-frame back to 1914

A 30-year history is not bad but, anxious to avoid the problems that come with arbitrary start and end-dates, we have gone back to September 1914 – the furthest we could go while maintaining a selection of six US assets: stocks, commodities, gold, IG credit, government debt (govt) and cash. Again, gold is treated as a separate asset class, even though it does appear in broad commodity indices ("commodities").

There are many similarities between this period and that since 1987: stocks and cash are at opposite ends of the efficient frontier; govt debt and IG credit are slightly within the efficient frontier; gold and commodities are nowhere near the efficient frontier but have the advantage of offering diversification (limited correlation to other assets). Once again, gold offers similar returns to cash but with much higher volatility (accepting that the price of gold was largely fixed until the late-1960s, with a period of catch-up thereafter).

One big difference when we lengthen the time horizon is that the correlation of government debt with other assets is now like that of IG credit, rather than being close to zero. This has a big impact on the optimal allocations: government debt now has no role to play, no matter what level of risk is accepted. On the other hand, IG credit plays a big role, especially when a mid-range level of risk is sought. Cash is preferred if risk tolerance is low and stocks are preferred when risk tolerance is high (see **Figure 3**).

Figure 3 – Optimal allocations along the efficient frontier (based on calendar year returns 1915-2016)
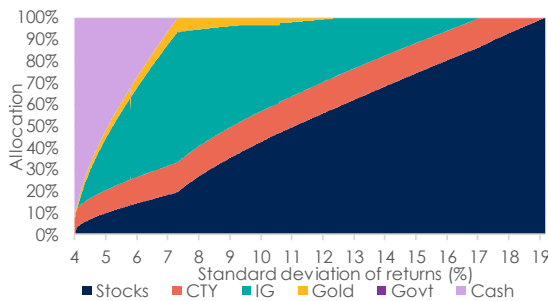
For each level of risk (standard deviation of returns), the chart shows the allocation of assets that would maximise returns and therefore be on the efficient frontier (based on calendar year returns 1915-2016 inclusive). Source: Global Financial Data, Robert Shiller, Reuters CRB, S&P GSCI, Datastream and Invesco PowerShares Research (see Data Appendix).

Equities dominate but be careful
A glance at the returns since 1914 shows just how strong has been the return on equities versus other assets. For, instance the annualised risk premium versus government debt has been 5%. For the same volatility, equities offered 6% more per year than gold!

Looking at the returns on a calendar year basis (from 1915 to 2016), equities were the best performing asset in 45% of the years and ranked number 1 or number 2 60% of the time. The problem is that equity returns tend to be either very good or very bad (all or nothing), as do those of commodities. On the other hand, assets such as cash, government debt and IG credit are rarely top performers but they do not often come last (they are usually somewhere in the middle).

Avoiding the equity downside
Despite offering the best long-term returns, there is a catch with stocks: they have generated a loss in one out of every four years (one in three if we use inflation adjusted returns). The holy grail, therefore, is to hold a lot of equities and similar assets, except in the years when they are down. What could be easier?

To work out how to do this, we have undertaken an analysis of those years in which stocks have declined (or were among the two worst performing assets). In the period considered (1915-2016), there were 27 such calendar years.

Unsurprisingly, when stocks do poorly, cash, govt debt or IG credit often top the rankings. Less obvious is that commodities most often come out on top when stocks are down (in 9 out of the 27 years). Frustratingly, in the 12 out of the 27 years when stocks were down but were not the worst performing asset, commodities often ranked bottom (8 years out of 12).

If inflation is rising when stocks do poorly, commodities tend to do well. If inflation is falling when stocks do poorly, commodities tend to suffer. This raises the issue of causality: movements in commodity prices have a big impact on inflation. As discussed below, this makes it hard to draw solid conclusions about how commodities perform during the economic cycle (there is high correlation with headline inflation but no correlation with core inflation – see **Figure 29**).

Our analysis suggests that several conditions are often associated with equity bear markets: war, economic recession (including rising unemployment), rising inflation and rising bond yields. None of these have always been present across the 27 cases we examine (recession and rising inflation are the most common) and none of them is a guarantee of a bear market: serious war has a high "hit-rate" but even recessions do not always produce an equity bear market (only one in two has done so historically). Interestingly, we found little correlation with Fed tightening cycles.

Unfortunately, if we are to avoid bear markets, we need to forecast when such events will occur and that is not easy. **Figure 4** shows our assessment of the probabilities over the next 12 months. We are assuming that the US economic cycle is advanced but not yet over. An important war has occurred roughly once every 10 years over the last 100 years (10% probability in any one year) and we assume the Trump presidency has doubled that probability.

Figure 4 – How probable is a US equity bear market?
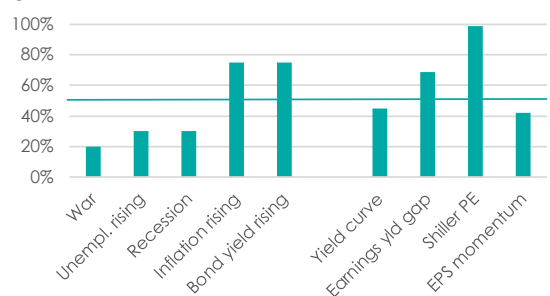
Left hand group shows factors often associated with bear markets and our assessment of the probability of them occurring in the next 12 months. Right hand group shows measurable factors associated with bear markets expressed as cumulative probability assuming a normal distribution and using mean and standard deviation of post-1881 history (post-1914 for yield curve). Earnings yield gap is the inverse of the Shiller PE minus the 10-year treasury yield. EPS momentum is 3m/3m change. As of October 27, 2017. Source: Global Financial Data, Robert Shiller, Datastream and Invesco PowerShares Research (see Data Appendix)

Given the difficulty of predicting such events we also tested objective measures that could help us foresee the next bear market. Those that we found to be the most efficient were (in order): slope of the yield curve, earnings yield gap (based on the Shiller PE), Shiller PE and EPS momentum (three-month on three-month).

These measures are also shown in **Figure 4** and are expressed as cumulative probabilities based on post-1881 histories (post-1914 for yield curve), assuming a normal distribution (which allows standardisation). Given their construction, the closer they get to 100%, the more danger there is of an equity bear market.

Based on current readings, the only one of the four that appears problematic is the Shiller PE (it has only been higher 1% of the time since 1881). However, our analysis suggests a high Shiller PE is neither a necessary nor a sufficient condition for a bear market (though we suspect it increases the downside when the bear market eventually arrives).

Figure 5 puts the current scores in a historical context, by taking the average of those measures every month since 1900 (at any moment in time, each individual measure is compared to the distribution up to that point – the sample history therefore lengthens with time). The bear market indicator should be centred on 50%, with higher readings suggesting more probability of a bear market.

Comparing the indicator with shaded bear market periods suggests it would have predicted some but not all bear markets and that it may have given some false signals. The current reading is 64% -- above the 50% "neutral" point but not alarming, in our opinion. In fact, as confirmed by **Figure 4**, the only component that is "flashing" is the Shiller PE and that can happen for some time before a bear market occurs.

Figure 5 – Bear market indicator (higher is worse)
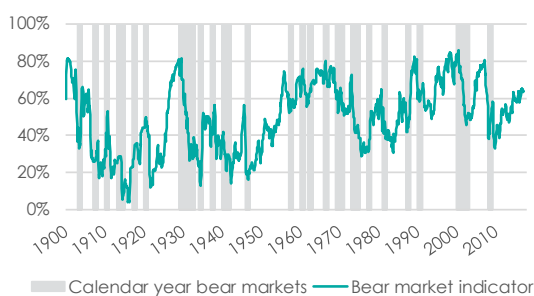
The bear market indicator is the average of the US yield curve (10y yield minus Fed rates), earnings yield gap (inverse of Shiller PE minus 10-year yield), Shiller PE and EPS momentum (3m/3m). Each of the four indicators is expressed with reference to the cumulative distribution of its own history since 1881 (since 1914 for yield curve), assuming a normal distribution. All are calibrated so that a higher reading suggests more risk of an equity bear market (maximum = 100%). From 1900 to October 27, 2017. Source: Global Financial Data, Robert Shiller, Datastream and Invesco PowerShares Research. See Data Appendix.

Our conclusion is that the next US equity bear market, though getting closer by the day, is not imminent. However, when it comes it could be painful.

How does each asset perform during the cycle?
Using the correlation of US CPI-adjusted total returns with several economic and financial indicators, we have tried to identify which asset classes perform best at which stage of the economic cycle. We have calculated the correlations using calendar year returns for both the full data history (starting in 1915) and the shorter period since 1987 (the latter allows us to look at a broader range of assets). We have used real rather than nominal returns to capture the relationship with the final spending power afforded by each asset.

The results can be seen in **Figures 21 to 32**. The correlations are sometimes low and we suspect a more accurate picture would come from a multi-variate approach. However, we think our simpler method reveals some important features that we can summarise as follows (see Data Appendix for definitions):

Gold: looking at the full data set since 1915, gold benefits when inflation is rising, when the Fed is raising rates and when the yield curve flattens. However, the evidence of recent decades suggests the emphasis should be placed upon periods of economic acceleration (when the rate of production growth is increasing), rising inflation and, interestingly, rising unemployment. The price of gold seems to have been less correlated to Fed policy in recent decades.

Cash: does better during periods of recession, when unemployment is rising, inflation is falling, the Fed is cutting rates and the yield curve is steepening (though the relationship with the yield curve is less clear in the post-1987 period).

Government debt: like cash, it does well when the economy decelerates and shrinks, when unemployment is rising, when inflation is falling, when the Fed cuts rates (and of course when treasury yields decline). The relationship with the slope of the yield curve does not appear significant.

IG credit: performs pretty much like government debt but with less sensitivity to economic and rate cycles. There is evidence from recent decades that it does well when the economy accelerates, presumably via the link to corporate results. Overall, a counter-cyclical asset.

HY credit: data is only available for the post-1987 period and, not surprisingly, HY credit falls somewhere between the "defensive" fixed income assets and the "cyclical" equity-like assets. Consequently, the correlations are not that impressive, except for when

the economy accelerates. HY benefits a lot (and perhaps first) in the early stages of the cycle and suffers a lot (and perhaps first) in the early stages of deceleration/downturn. Overall, HY does better when the economy accelerates, when inflation and bond yields rise and, bizarrely, when unemployment rises (just to show it is somewhere between being defensive and cyclical).

Equities (large-caps): a typical cyclical asset, doing well when output is rising and unemployment falling (though seemingly lagging HY when it comes to turning points in the cycle). There seems little correlation with inflation and over the long haul (since 1915) there has been little correlation with Fed rates, bond yields or the slope of the yield curve. In more recent decades (since 1987), large cap stocks have tended to do well when the Fed raises rates, when bond yields rise and when the yield curve flattens.

Equities (small-caps): small-caps follow broadly the same pattern as large-caps. They are cyclical (perhaps less so than large-caps) and rise with Fed rates (and when the yield curve flattens).

REITS: real estate investment trusts follow the same pattern as equities (cyclical, positive correlation with Fed rates and negative correlation with the yield curve). Contrary to popular opinion, there appears to be no correlation with bond yields.

Commodities: not surprisingly, commodities appear to be cyclical, with better returns the more that production is growing and the lower that unemployment goes. There also appears to be a strong positive correlation with inflation. However, as mentioned earlier, the same correlation does not exist with core CPI (CPI ex-food & energy), hence we conclude that the direction of causality likely runs from CTY prices to inflation, rather than the inverse (oil and food are important components of the CPI index). Hence, it may be the case that higher commodity returns are associated with higher inflation but it is not clear that higher inflation causes those better CTY returns. Likewise, it is difficult to be certain whether the positive correlation with Fed rates and bond yields and the negative correlation with the yield curve are causal or simply a reflection that higher CTY prices cause inflation that then results in a tighter Fed, rising bond yields and a flattening yield curve.

What to prefer when

Our interpretation of all the evidence in this document gives the following order of preference at each stage of the economic cycle (the colour coding shows whether we expect CPI-adjusted returns to be positive (blue), neutral (black) or negative (red):

Early-expansion (economy bottoming/accelerates, unemployment peaks, inflation low, central bank still easing, yield curve bull flattens): HY, CTY, REITS, stocks, gold, IG, cash, government debt.

Mid-expansion (economy moves to peak growth, unemployment falling, inflation pressures build, central bank starts tightening, yield curve bear steepens): stocks, CTY, REITS, HY, gold, cash, IG, government debt.

Late-expansion (economy decelerates, unemployment bottoms, inflation rising, central bank tightens, yield curve bear flattens/becomes inverted): stocks, CTY, REITS, HY, gold, cash, IG, government debt.

Recession (economy shrinking or growing very slowly, unemployment rising, inflation easing, central bank starts easing, yield curve bull steepens): government debt, IG, cash, gold, HY, REITS, CTY, stocks.

Where are we now?

Accepting that each cycle is different, our feeling is that the US economy is currently in the late-expansion phase. This suggests that cyclical assets such as stocks, commodities and real estate (REITS) should still be preferred. The evidence from our own bear market indicator supports this conclusion.

Even better, we feel that the global economic cycle is less advanced than that of the US, with many countries/regions in the early or mid-expansion phases. This encourages us to stick with cyclical assets in our global asset allocation process.

Though the US economy is no longer as important as it was (as a share of global GDP), we believe that US markets continue to dominate each asset class. We will therefore be keeping a close eye upon the US economic cycle above all others. Given that the US economic and stock cycles have been long, we are watchful but not yet worried.

Global asset allocation -- the strange attraction of gold

Figure 6 – Optimal allocation of global assets along the efficient frontier (Jan 1998 - June 2017)
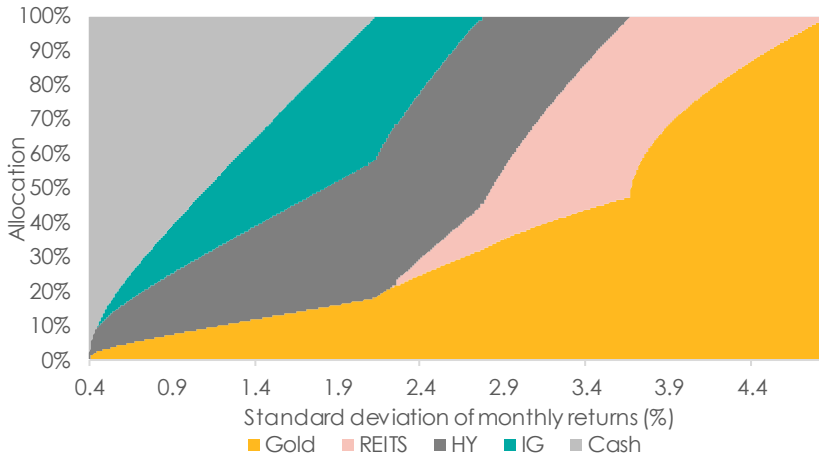

- By definition optimal portfolios give the maximum return for each level of risk.
- Of the eight assets considered, only five are needed to construct optimal portfolios (if the last 20 years are repeated).
- Gold is prominent and there is no role for stocks or government debt.

Figure 7 – The efficient frontier for global assets based on CPI adjusted total returns in USD (Jan 1998 to Jun 2017)
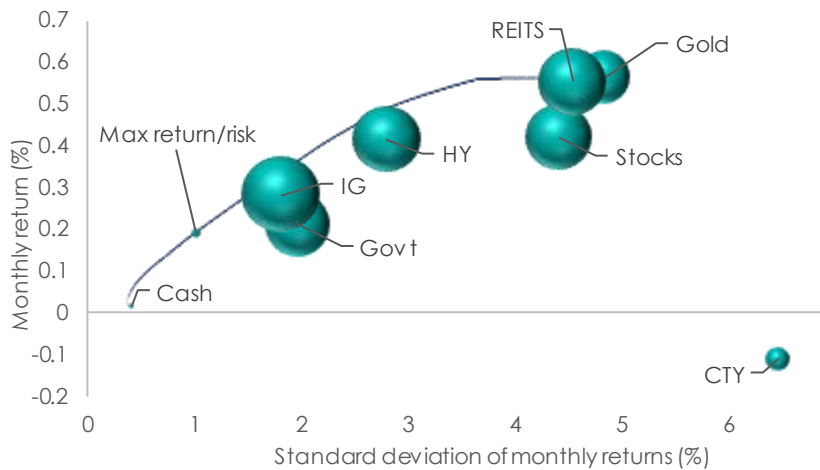
- Size of bubble is in proportion to average pair-wise correlation with other assets.
- Those assets closest to efficient frontier will dominate optimal portfolios.
- Over the timeframe considered, gold produced the highest returns (and the highest volatility, except for broad commodities).

Figure 8 – CPI adjusted total return indices in USD on global assets from Dec 1997 to Jun 2017 (Dec 1997 = 100)
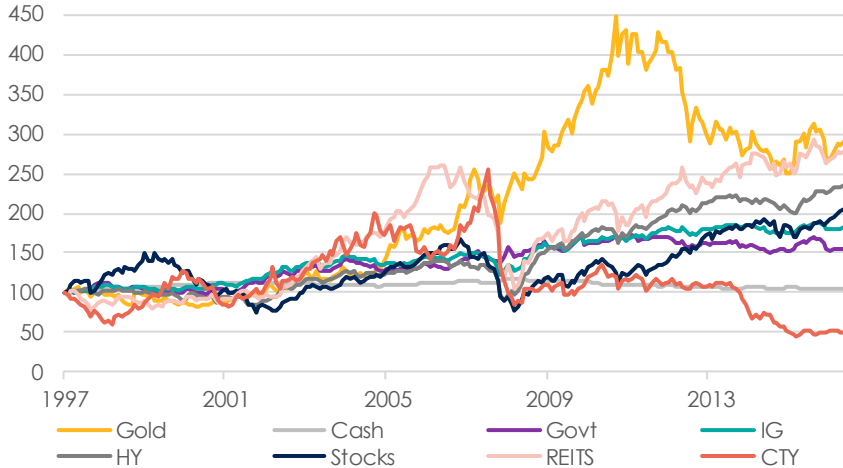
- Gold and real estate were the cumulative leaders over the last 20 years (and broad commodities the clear laggard).
- How representative is that period? Unfortunately, it is the longest data period we have at the global level (for this range of assets).
- To go further back we need to focus on the US market.

Source: BofAML, GPR, JP Morgan, MSCI, S&P GSCI, Datastream and Invesco PowerShares Research (see Data Appendix for definitions)

## US asset allocation based on returns since 1987 – that's more like it

Figure 9 – Optimal allocation of US assets along the efficient frontier (annual returns from 1987 to 2016)
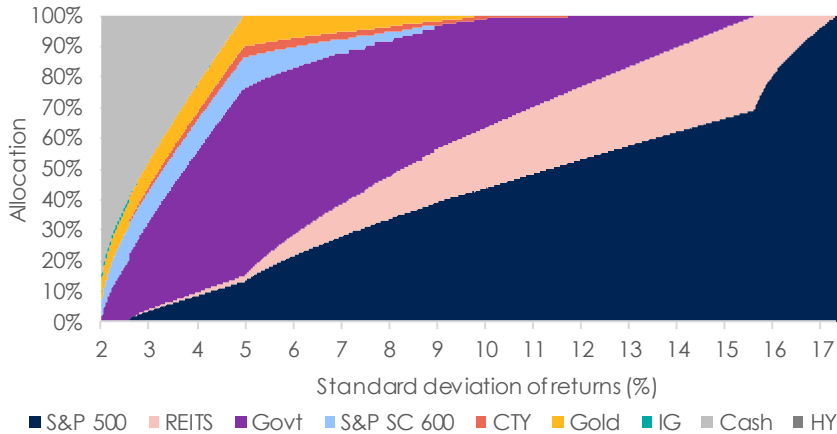
- US data allows us to go back to 1987 for a full range of assets, including small-cap stocks (S&P SC 600).
- Equities, real estate and government debt dominate optimal portfolios, except for the most conservative.
- IG credit barely features and HY credit does not appear at all.

Figure 10 – The efficient frontier for US assets based on annual CPI adjusted total returns (1987 to 2016)
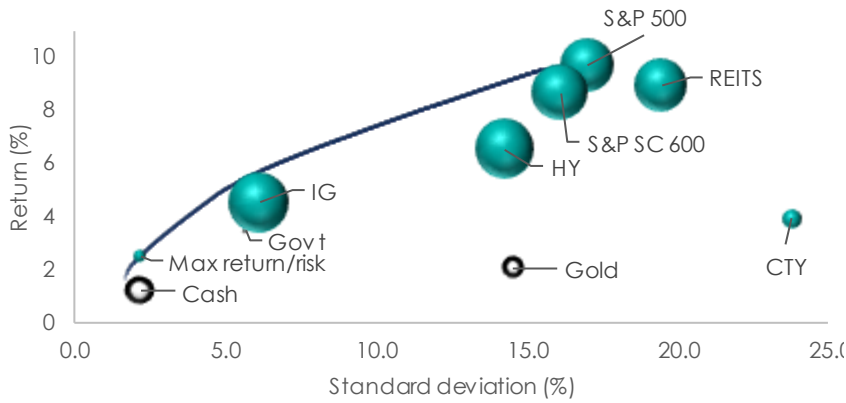
Size of bubble is in proportion to average pairwise correlation with other assets (cash and gold correlations are negative, that for govt is close to zero).

- Again, those assets closest to the efficient frontier dominate the optimal portfolios.
- Government debt is preferred to IG because of its low correlation to other assets.
- Commodities and gold appear in optimal portfolios only because of low/negative correlation.

Figure 11 – CPI adjusted total return indices for US assets from Aug 1986 to Jun 2017 (Aug 1986 = 100, log scale)
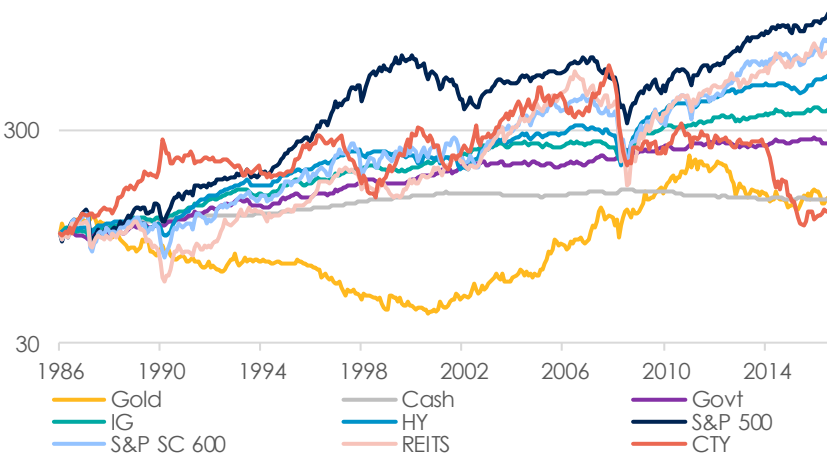
- Comparing this time series to the same chart on the previous page shows the importance of start (and end) dates.
- Here, gold barely matches cash over the full period (with a lot more volatility); there, it was the top performing asset.
- Here, stocks come out on top, there they barely outperform IG.

Based on calendar year returns from 1987 to 2016, inclusive, unless stated otherwise.

Source: BofAML, GPR, JP Morgan, S&P GSCI, Datastream and Invesco PowerShares Research (see Data Appendix for definitions).

Extending the time-frame back to 1914 (for US assets)

Figure 12 – Optimal allocation of US assets along the efficient frontier (annual returns from 1915 to 2016)
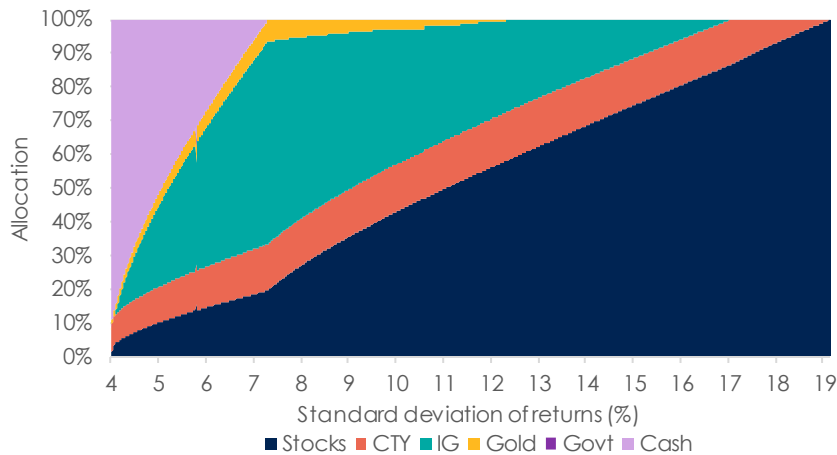
- Extending the period back to 1914 limits us to six assets.
- Based on that full period, stocks and commodities would feature in all optimal portfolios.
- Interestingly, government debt does not appear.
- Cash and IG credit are important for those seeking low volatility.

Figure 13 – The efficient frontier for US assets based on annual CPI adjusted total returns (1915 to 2016)
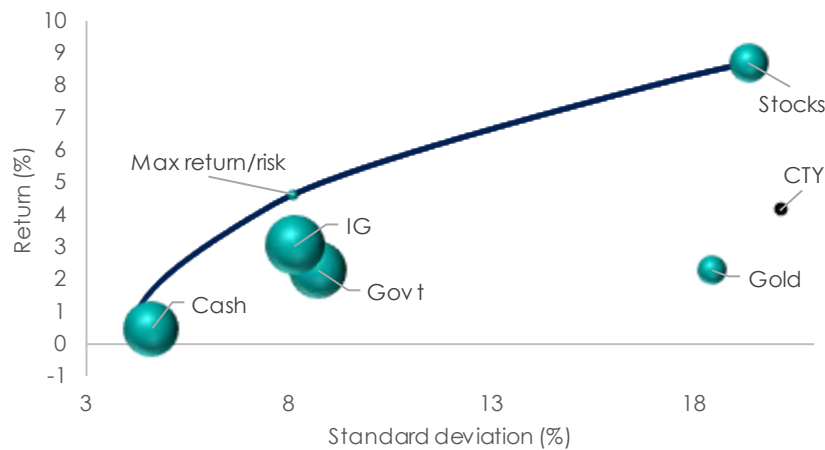
- It is easy to see why stocks dominate: the asset class gave the best returns and has low correlation to other assets (indicated by size of bubble).
- Despite being off the efficient frontier, commodities and gold are in optimal portfolios because of low correlation (negative for CTY).
- Now IG preferred to sovereign debt.

Figure 14 – CPI adjusted total return indices for US assets from Sep 1914 to Jun 2017 (Sep 1914 = 100, log scale)
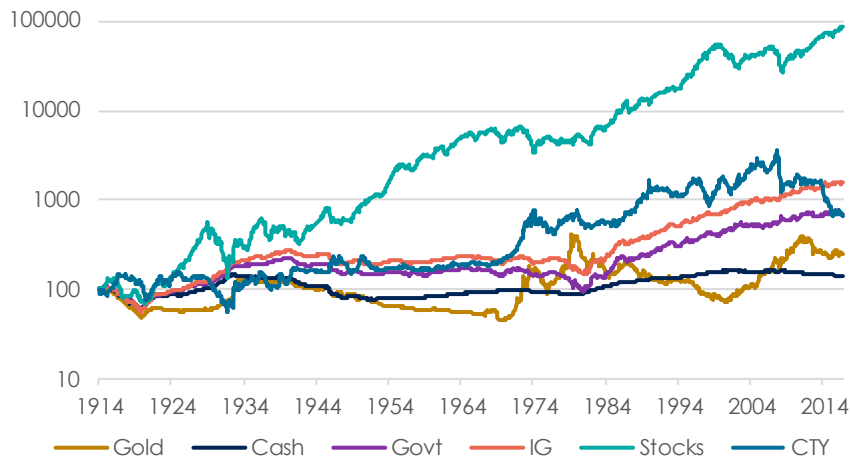
- Stocks have outperformed by a large margin and do not currently seem out of line with the historical trend.
- Gold seems to track cash returns over the long-haul, though the price was fixed for much of pre-1970 period.
- Commodities look to have returned to the pre-1970 trend.
- Are govt. and IG trends sustainable?

Source: Robert Shiller, Global Financial Data, Reuters CRB, S&P GSCI, Datastream and Invesco PowerShares Research (see Data Appendix).

Alternative ways to look at the long-term data (for US assets)

Figure 15 – Annualised US asset returns from Sept 1914 to June 2017 in % (data labels show risk premia)
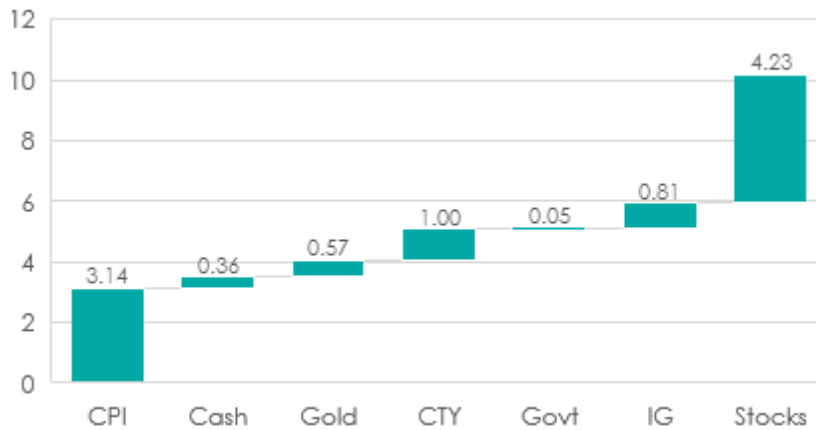
- All assets have provided a premium over inflation.
- The ranking looks about right given received wisdom, though a surprise that CTY has underperformed govt. and IG debt.
- Annualised risk premium on stocks versus government debt is 5.04%.

Figure 16 – Frequency distribution of annual total return rankings from 1915 to 2017 (using 2017 H1)
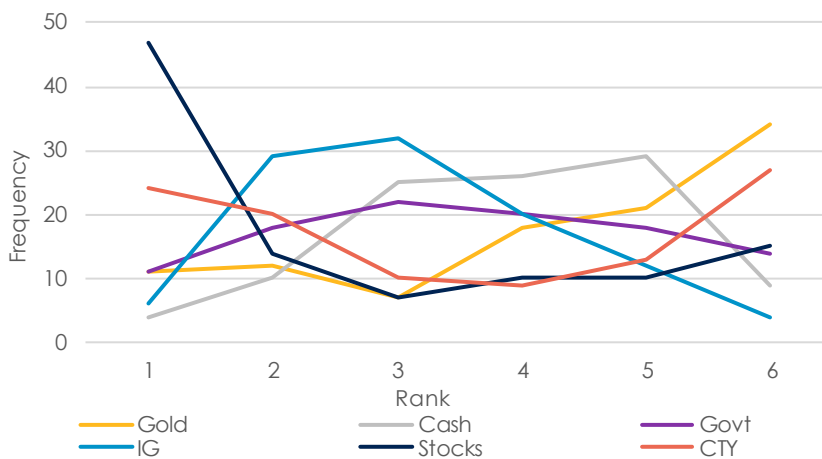
- Assets such as stocks and commodities tend to either rank very high or very low (all or nothing).
- Cash, govt. and IG debt tend to rank in the middle (neither hot nor cold).
- Gold has its moments but more bad than good (though remember the price was largely fixed pre-1970).

Figure 17 – CPI adjusted total return on US stocks in years that each asset class ranked #1 (%, 1915 to 2016)
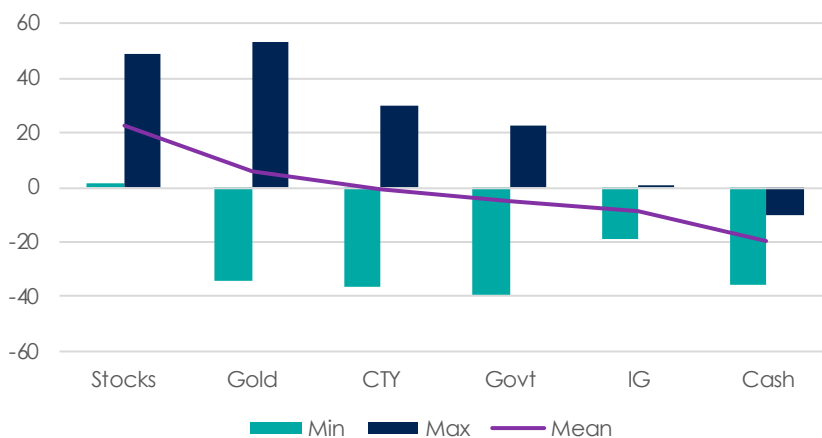
- Stocks were the top performing asset in 42 out of 102 years from 1915 to 2016 (45% of the time). They ranked 1 or 2 in 60% of the years.
- But they were down in one out of every four years (one in three in real terms).
- Stocks tend to be weakest when cash or IG are the top performers (which happens about 10% of the time).

Rankings are based on the ordering of assets by total return in each year from 1915 to 2017 (using H1 data for 2017).

Source: Robert Shiller, Global Financial Data, Reuters CRB, S&P GSCI, Datastream and Invesco PowerShares Research (see Data Appendix)

# When to step away from equities – not just yet, it would appear

Figure 18 – What are US equity bear markets associated with? Based on calendar year total returns since 1915
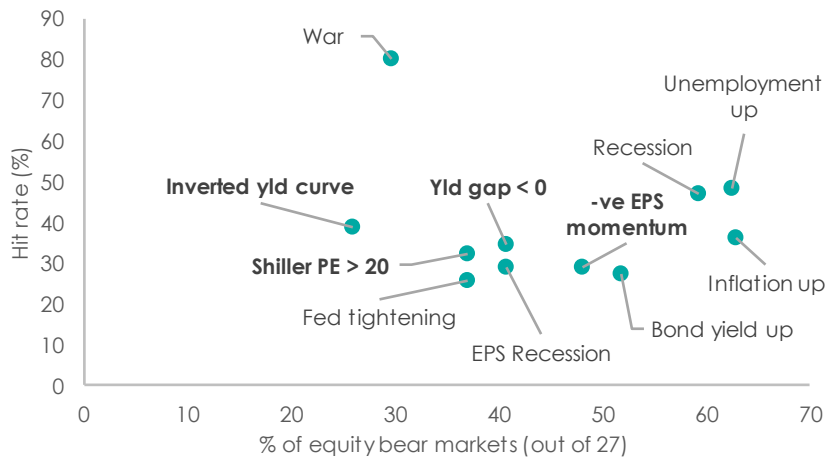
- Horizontal axis measures proportion of equity bear markets for which stated condition was present.
- Hit rate is the proportion of the times the stated condition occurred and was associated with negative equity returns (or equities being in lowest third of assets).

Figure 19 – Our favoured bear market indicators for US equities as of 27/10/17 (higher readings suggest more risk)
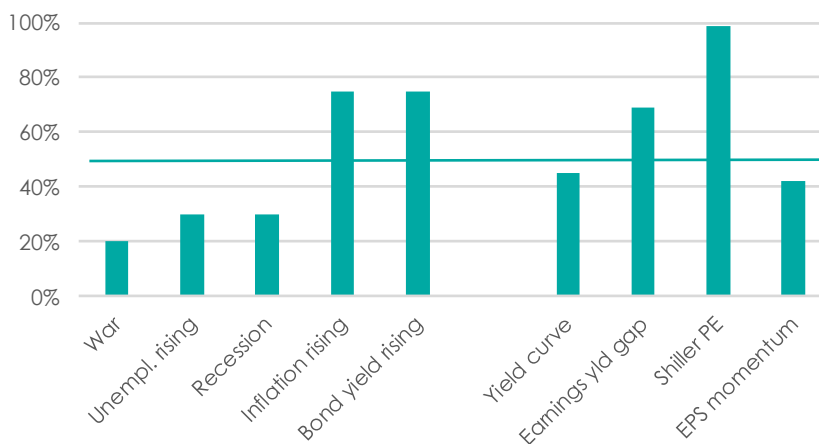
- Left hand group shows our assessment of probability in the next 12 months.
- Right hand group shows current readings expressed as cumulative probability assuming a normal distribution and using mean and standard deviation of post-1881 history. EPS momentum is 3m/3m change.

Figure 20 – US equity bear market indicator (higher is bad) and calendar years when stocks were down
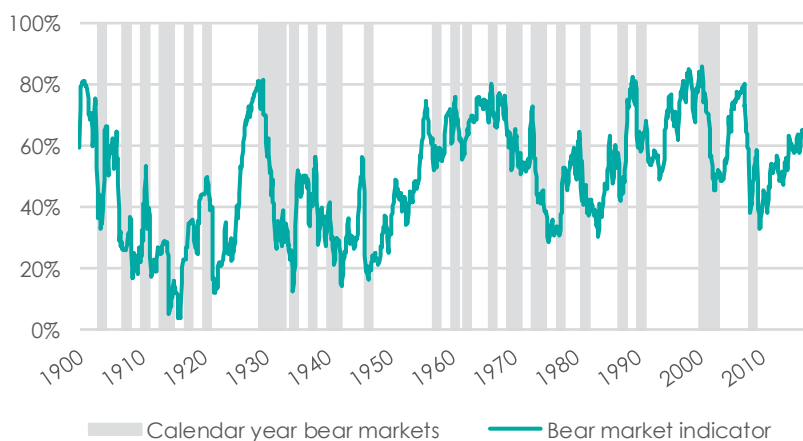
- Average of yield curve, earnings yield gap, Shiller PE and EPS momentum, expressed as cumulative probabilities given historical distribution (using the full history up to each point).
- It captures some but not all bear markets.
- Current reading a little above normal but not critical.

Figure 18: items in bold are as measured at the start of each year. Others are conditions met during the year. Based on the 27 years from 1915 to 2016 when US equity total returns were negative or when equities ranked among the bottom third of assets. Figure 20 is from 1900 to 27/10/17. Source: Robert Shiller, Global Financial Data, Reuters CRB, S&P GSCI, St. Louis Fed, Datastream and Invesco PowerShares Research (see Data Appendix)

Asset allocation during the cycle (based on calendar year data)

Figure 21 – Correlation between US CPI adjusted total returns and industrial production (IP) growth (1915-2016)
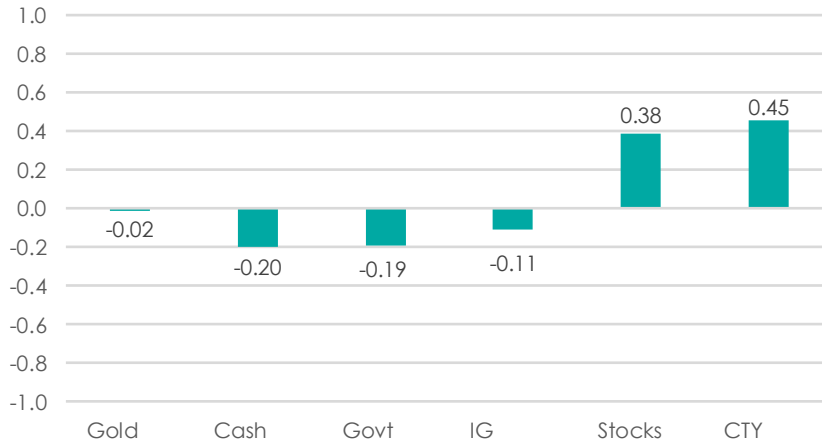

- Confirmation that stocks and commodities are cyclical (gold is not).
- Cash and bonds tend to lose value when the economy is strong.
- A similar pattern holds if we use changes in rate of growth of IP (acceleration favours stocks and CTY).

Figure 22 – Correlation between US CPI adjusted total returns and changes in unemployment rate (1930-2016)
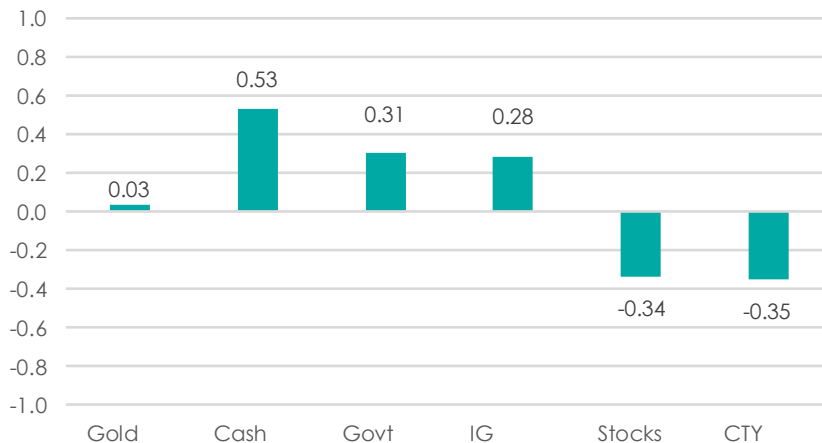
- Unemployment gives similar results to IP.
- Falling unemployment Is associated with positive returns on stocks and CTY.
- Cash appears to have been the asset receiving the biggest boost when unemployment rises.
- Again, gold is not at all cyclical (based on real returns).

Figure 23 – Correlation between US CPI adjusted total returns and changes in the rate of inflation (1915-2016)
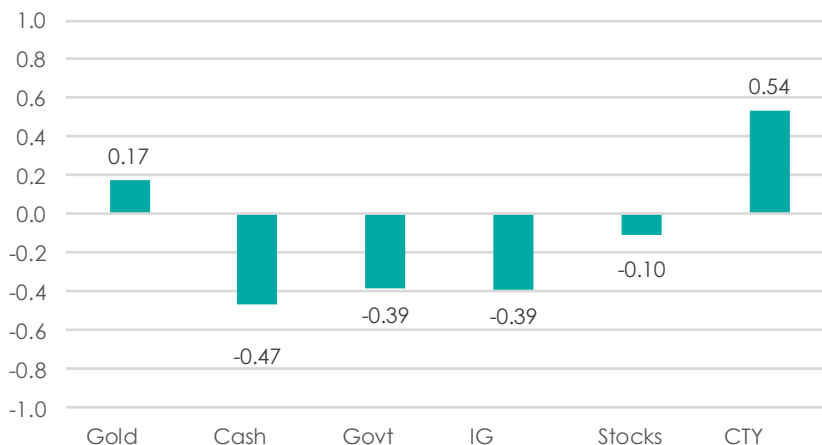
- Rising inflation is associated with negative real returns on cash and bonds.
- The correlation with stocks is negative but limited.
- Commodities would appear to rise with inflation but it is difficult to know the direction of causality (of which more later).
- Gold appears to offer some protection against inflation.

All charts are based on correlations using calendar year data over the periods shown in the titles.
Source: Robert Shiller, Global Financial Data, Reuters CRB, S&P GSCI, St. Louis Fed, Datastream, Invesco PowerShares Research (see Data Appendix).

Asset allocation and interest rate cycles (based on calendar year data)

Figure 24 – Correlation between US CPI adjusted total returns and changes in Fed rates (1915-2016)
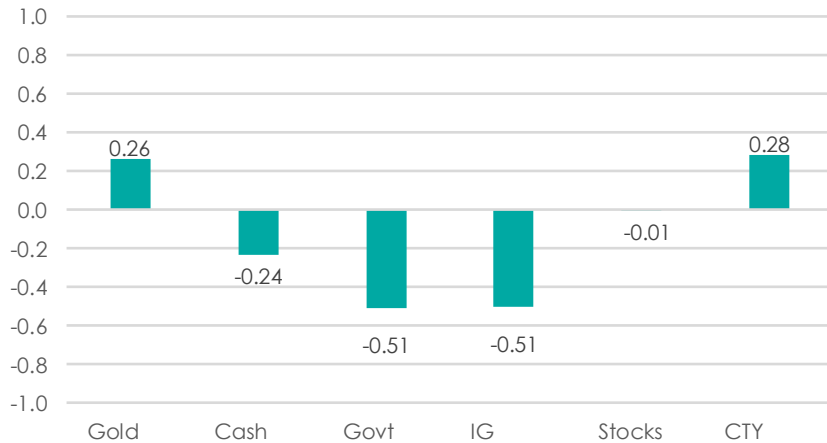

- There seems to be no relationship between Fed rate cycles and real stock returns.
- Gold and commodities seem to do well when the Fed raises rates, though it may be strong commodities that force the Fed to hike.
- Naturally, cash and bonds suffer when the Fed tightens.

Figure 25 – Correlation between US CPI adjusted total returns and changes in 10-year treasury yields (1915-2016)
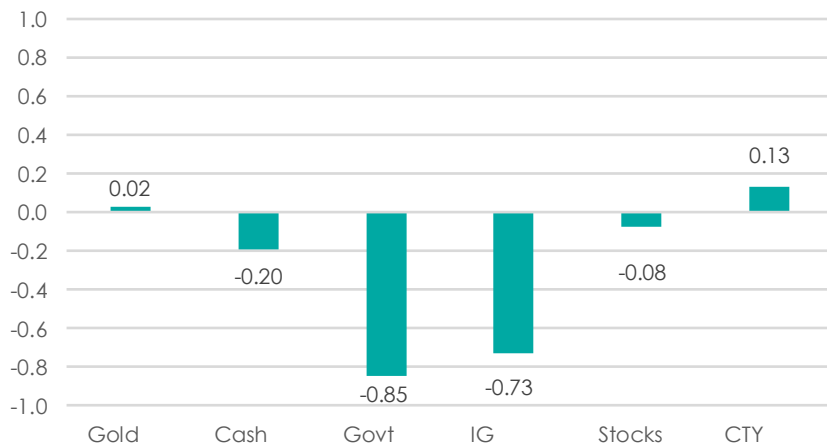
- Not surprisingly, when treasury yields rise, treasury bonds suffer the most, along with IG credit.
- Gold and stocks appear to have little correlation with bond yields.
- Commodities seem to be the most correlated with bond yields, though again the direction of causality is not clear.

Figure 26 – Correlation between US CPI adjusted total returns and changes in slope of the yield curve (1915-2016)
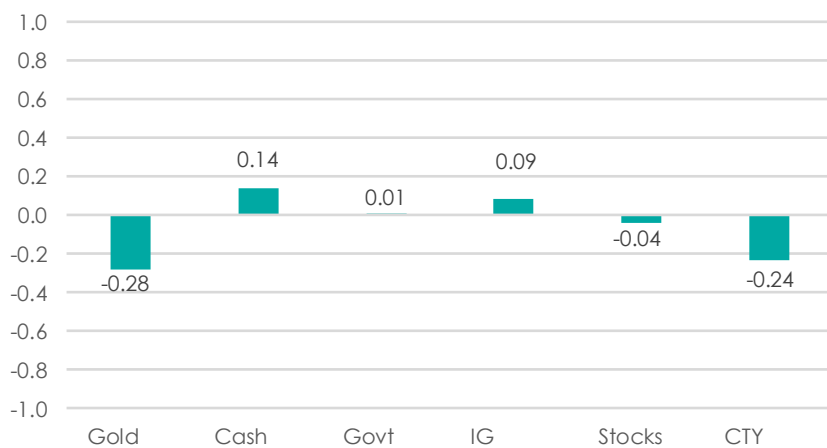
- Yield curve is defined as 10-year yield minus Fed rates.
- There appears to be little correlation with most asset groups.
- Gold and commodities have tended to do better when the yield curve flattens, which tends to happen when the Fed is tightening. The direction of causality is not clear for CTY.

Correlations are based on calendar year data from 1915 to 2016, inclusive. Source: Robert Shiller, Global Financial Data, Reuters CRB, S&P GSCI, St. Louis Fed, Datastream and Invesco PowerShares Research (see Data Appendix).

Asset allocation during more recent cycles (based on calendar year data)

Figure 27 – Correlation between US CPI adjusted total returns and industrial production growth (1987-2016)
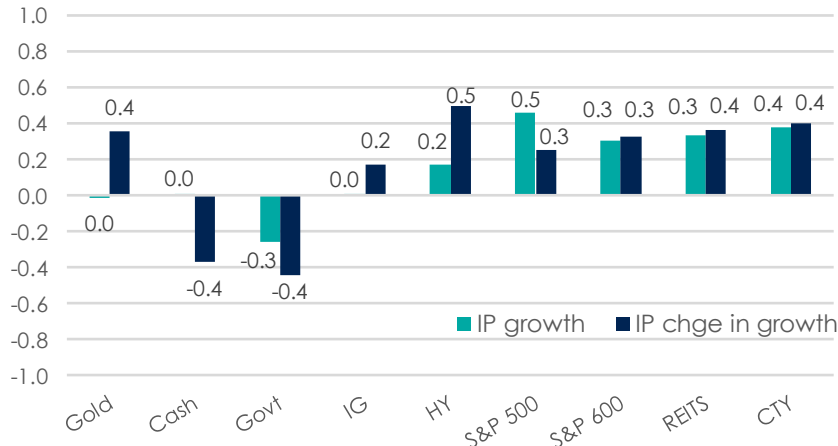
- Not surprisingly, the most cyclical assets are stocks, REITS and CTY, with govt debt suffering the most when economy growing.
- Looking at the 2nd derivative of IP, HY seems to do best in early part of upswing (and worst in early part of downswing).
- Gold is not overall cyclical but reacts in early stages.

Figure 28 – Correlation between US CPI adjusted total returns and changes in unemployment (1987-2016)
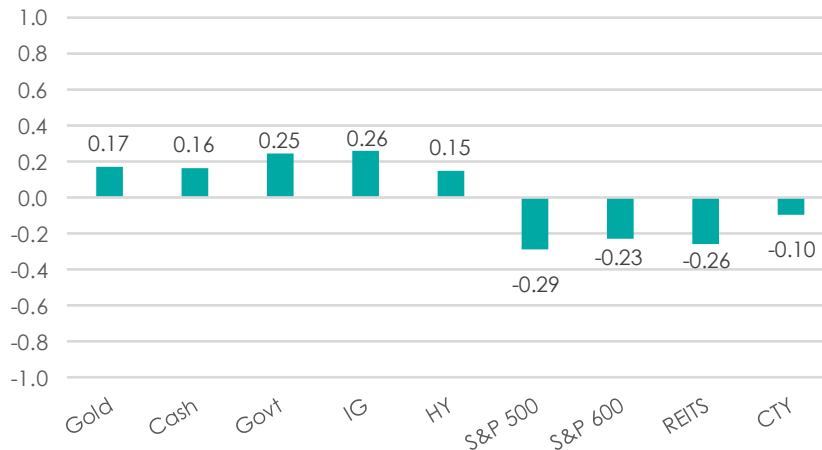
- Though the pattern is like the full 1915-2016 period, the correlations appear lower than before.
- Rising unemployment. Is associated with gains in gold and fixed income assets (including HY).
- Falling unemployment. Is better for stocks and REITS.
- The correlation with CTY is limited.

Figure 29 – Correlation between US CPI adjusted total returns and changes in CPI inflation (1987-2016)

- Fixed income tends to suffer when inflation rises, as do small cap stocks and REITS, to a lesser extent.
- HY and S&P 500 display little correlation with inflation.
- Gold and CTY are positively correlated with inflation. CTY has little correlation with core inflation suggesting causality may run from CTY to inflation.

Correlations are based on calendar year data from 1987 to 2016, inclusive.
Source: BofAML, GPR, JP Morgan, S&P GSCI, Datastream and Invesco PowerShares Research (see Data Appendix).

Asset allocation and recent interest rate cycles (based on calendar year data)

Figure 30 – Correlation between US CPI adjusted total returns and changes in Fed rates (1987-2016)
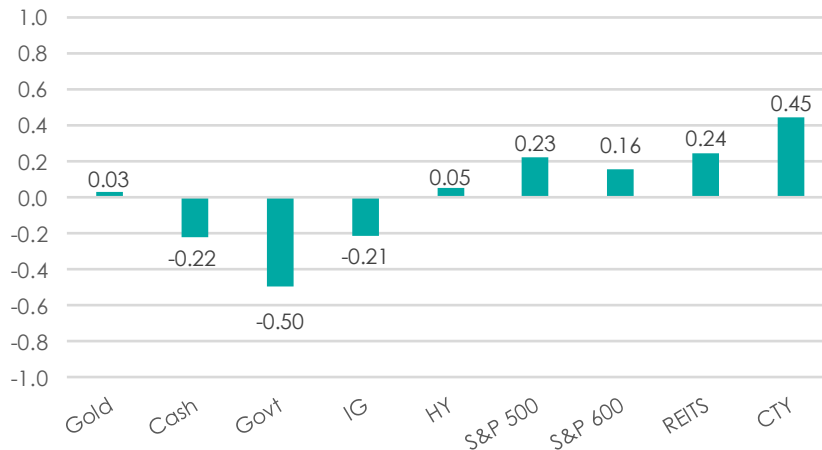

- Recently, there seems to be a weak link between Fed rates and real returns on gold and HY.
- Other fixed income assets suffer when the Fed hikes.
- Stocks, REITS and CTY tend to do well when the Fed raises rates (and vice-versa).
- Again, the direction of causality with CTY is not clear.

Figure 31 – Correlation between US CPI adjusted total returns and changes in 10-year treasury yields (1987-2016)
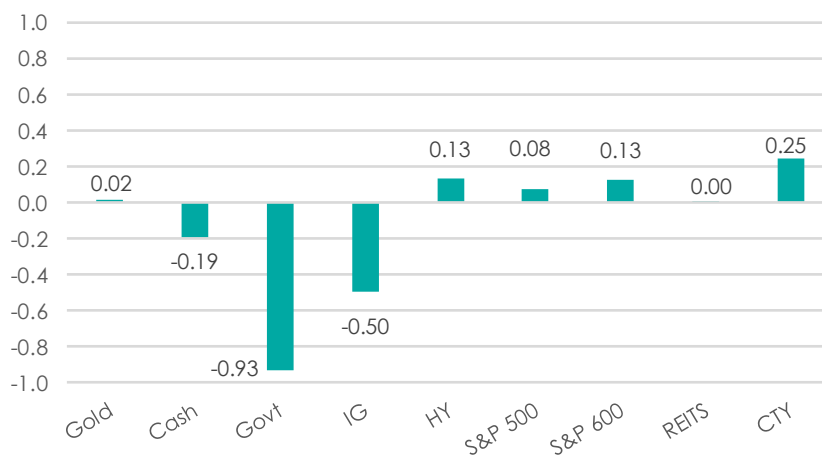
- It would be amazing if the returns on treasuries were not inversely correlated with treasury yields.
- Cash and IG also suffer when yields rise but HY seems to escape the damage.
- The correlation with HY, stocks and REITS is limited.
- That with CTY is bigger but the flow may be from CTY via inflation.

Figure 32 – Correlation between US CPI adjusted total returns and changes in slope of the yield curve (1987-2016)
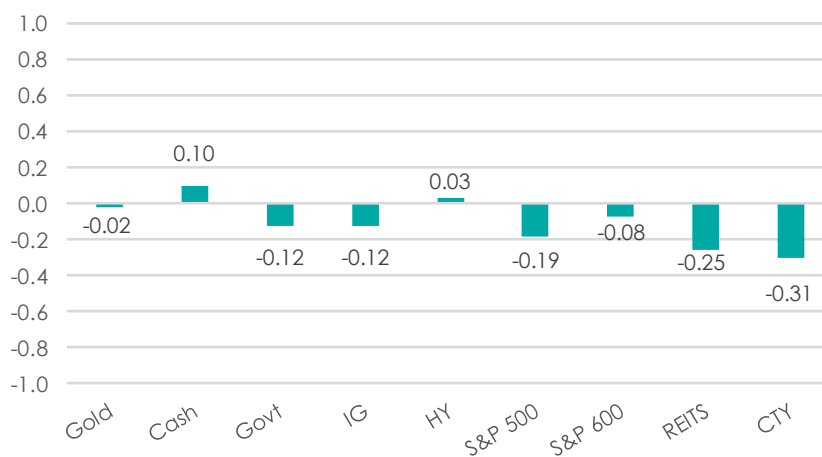
- Yield curve is 10-year yield minus Fed rates.
- There appears to be little correlation with most asset groups (as with the 1915-2016 period).
- Stocks, REITS and commodities have tended to do better when the yield curve flattens, which tends to happen when the Fed is tightening.
- Cash does better under steepening.

Correlations are based on calendar year returns from 1987 to 2016, inclusive.

Source: BofAML, GPR, JP Morgan, S&P GSCI, Datastream and Invesco PowerShares Research (see Data Appendix).

Data appendix: description and sources

Global analysis (December 1997-June 2017)
Cash: JP Morgan 1-month USD Cash Index (total return, source: Datastream)
Gold: London bullion market spot price in USD/troy ounce (source: Datastream)
Commodities (CTY): Standard & Poor's Goldman Sachs Commodity Index (total return in USD, source: Datastream)
Government/sovereign debt (Govt): Bank of America Merrill Lynch Global Government Index (total return in USD, source: Datastream)
Investment-grade credit (IG): Bank of America Merrill Lynch Global Corporate Index (total return in USD, source: Datastream)
High-yield credit (HY): Bank of America Merrill Lynch Global High Yield Index (total return in USD, source: Datastream)
Stocks/equities: MSCI World Index (total return in USD, source: Datastream)
Real estate investment trusts (REITs): GPR General World Index (total return in USD, source: Datastream)

US analysis (August 1986-June 2017)
Cash: JP Morgan 1-month USD cash index (total return, source: Datastream)
Gold: London bullion market spot price in USD/troy ounce (source: Datastream)
Commodities (CTY): Standard & Poor's Goldman Sachs Commodity Index (total return in USD, source: Datastream)
Government/sovereign debt (Govt): Bank of America Merrill Lynch US Treasury Index (total return in USD, source: Datastream)
Investment-grade credit (IG): Bank of America Merrill Lynch US Corporate Index (total return in USD, source: Datastream)
High-yield credit (HY): Bank of America Merrill Lynch US High-Yield Index (total return in USD, source: Datastream)
Large-cap stocks/equities (S&P 500): S&P 500 Index (total return in USD, source: Datastream)
Small-cap stocks/equities (S&P SC 600): S&P Small Cap 600 Index (total return in USD, source: Datastream)
Real estate investment trusts (REITs): GPR General US Index (total return in USD, source: Datastream)

Long-term US analysis (September 1914-June 2017)
Cash: 3-month US treasury bill total return index (calculated by and sourced from Global Financial Data)
Gold: London bullion market spot price in USD/troy ounce (source: Global Financial Data and Datastream)
Commodities (CTY): Reuters CRB Total Return Index from September 1914 to November 1969 and Standard & Poor's Goldman Sachs Commodity Index from December 1969 (total return in USD, source: Global Financial Data and Datastream)
Government/sovereign debt (Govt): total return on 10-year US treasury bonds, calculated by Invesco PowerShares Research, based on bond yields provided by Robert Shiller and Datastream
Investment-grade credit (IG): Global Financial Data US AAA Index (total return in USD, source: Global Financial Data)
Stocks/equities: we have calculated a total return index for broad US stocks based on index and dividend data from US academic Robert Shiller and Datastream. The index prior to 1926 is Robert Shiller's recalculation of data from Common Stock Indexes by Cowles & Associates (see here). From 1926 to 1957, the Shiller data is based on the S&P Composite Index and thereafter is based on the S&P 500 as we know it today

Other data
US Federal Reserve (Fed) interest rate: Fed Discount Rate from November 1914 to October 1982, then the Fed Funds Rate is used (source: Global Financial Data, Datastream)
US 10-year treasury yield (bond yield): monthly from 1871 (source: Robert Shiller and Datastream)
US Consumer Price Index (CPI): monthly from February 1875 (source: Global Financial Data)
US Consumer Price Index Ex-Food & Energy (core CPI): from 1957 (source: Datastream)
US Gross Domestic Product Index (GDP): annual since 1789 (source: Global Financial Data)
US Industrial Production Index: annual from 1790 and monthly from 1919 (source: Federal Reserve Bank of St. Louis and Global Financial Data)
US Unemployment Rate: annual from 1890 and monthly from 1929 (source: Global Financial Data)

US Shiller PE and Earnings Per Share (EPS): the Shiller PE is a price to earnings ratio constructed by dividing price by the average earnings per share in the previous 10 years (with both numerator and denominator adjusted for inflation). It is what is commonly known as a cyclically-adjusted PE ratio. It is constructed by US academic Robert Shiller. We also use the raw EPS data from his database to calculate EPS momentum on a 3m/3m basis (the percentage change in the latest three months versus the previous three months). Data is monthly from 1881 (source Robert Shiller – see here)

Recession: in Figure 18, recession is defined as a year in which either US GDP and/or US industrial production declined.

War: to construct Figure 18 it was necessary to decide which wars/geo-political crises to include in the analysis. The following were chosen: First World War (US entry into WW1 in 1917), Second World War (start in 1939 and US entry in 1941), Korean War (1950-53), Suez Crisis (1956), Cuban Missile Crisis (1962), Vietnam War (1955-75 but the US started large troop deployment in late 1965), Yom Kippur War (1973), Iraq invasion of Kuwait (1990), allied invasion of Iraq (2003).

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