Global Investment Research | Multi-asset

Higher correlation of multi-asset returns - temporary legacy of Covid, or permanent change?

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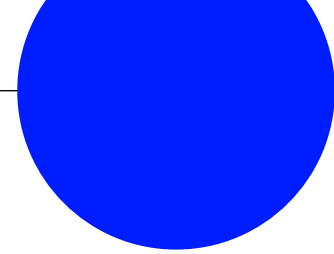Investment Research
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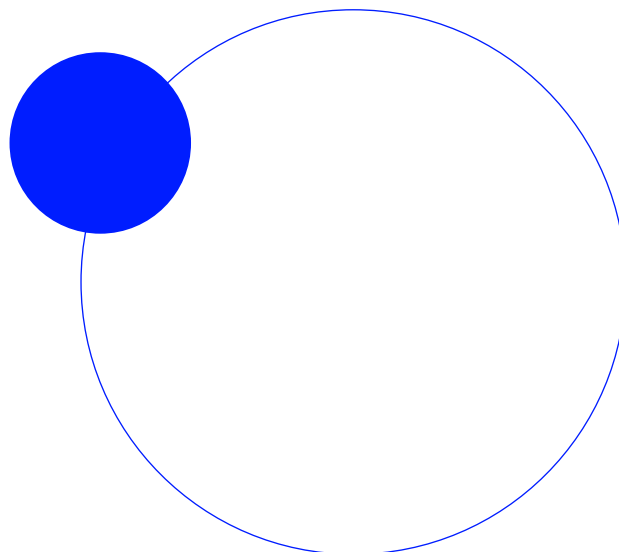Research, Americas
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Executive summary

– **Empirical evidence from FTSE Russell indices shows higher correlation of US asset returns has persisted in the post-Covid period, despite disinflation…**

– **…with confirmation of a structural break in 2021 for asset return correlations across bonds, equities and credit**

– **Only US high yield credit shows no structural break in correlation, confirming its risk characteristics are closer to those of equities than fixed income**

– **It is too early to draw strong conclusions about the durability of this increase in correlations of returns…**

– **….and its persistence may be due to higher-for-longer short interest rates and inertia in core inflation**

– **Our results indicate inflation is a strong driver of the higher correlation in asset returns, even if the relationship is non-linear, with the non-linearity evident when inflation moves above Fed target levels**

– **Since the relationship between inflation and stock-bond correlations is non-linear and non-monotonic, stock-bond correlations have become less stable. This makes stock-bond diversification benefits (particularly those from sovereign bonds) more variable over time**

– **These results indicate cross-asset correlations are not constant. Investors therefore need to be vigilant when making asset allocation and portfolio construction decisions**

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Introduction

Correlations of asset returns (CAR) clearly play a key role in asset allocation decisions, given the potential benefits from portfolio diversification. But these correlations are not directly observable and must be estimated from underlying data sets.

In addition, probability theory informs us there may be a link between volatility of returns and measured correlation. Specifically, in periods of higher volatility of returns, measured correlation will be higher, even if the underlying drivers of correlation have not changed.

This has led some to conclude that "correlation breakdowns may reflect time-varying volatility of financial markets rather than a change in the relationships between asset returns"[1]. But despite these statistical issues, changes in key macro drivers may also explain both the changes in CAR and the underlying volatility of returns (which in turn drives the higher correlations). So, in this paper, we seek to identify the key drivers of correlations in returns, using FTSE Russell multi-asset index data since 2000.

Post-Covid surge in correlations shows risks of relying on historical correlations

In an article we published last year[2] we pointed out the observed correlation of US stock and government bond returns had increased sharply in 2022-23, as central banks raised interest rates and inflation rose sharply. This ended a long period, starting in the mid-1990s, in which the correlation of global stock and government bond returns had been relatively stable, low and even negative (during the deflationary shocks of the GFC and Covid). Indeed, evidence since 2021-22 confirms that relying on historical correlations to predict future correlations may give poor results.

In this paper, we start by looking at the longer-term correlation of returns between US Treasuries and the Russell 1000 index of large-cap US equities. We then look at what correlations might be expected, given the structural differences between asset classes (from "risk-on" assets like ordinary equity, to cross-over assets like high yield credit, to higher quality investment grade credit, to pure "risk-off" assets, like government bonds).

We then present empirical evidence on the correlation of US multi-asset class returns since 2000 and identify the key drivers of these correlations. We also assess the period since Covid in more detail, finding evidence of a series of "perfect storms" that have boosted CARs in different sub-periods. We then offer possible macro-economic and policy rationalisations for these high correlations.

# The long-term evidence on the correlation of asset returns

The longer-term correlation of returns between the US 7-10 year Treasury index and the Russell 1000 index is shown in Figure 1. We use the 7-10 year Treasury index since US Treasuries are the purest risk-off asset, and have repeatedly proved a safe haven during financial crises.

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[1] See "Evaluating correlation breakdowns during periods of market volatility", Mico Loretan and William B. Englis, US Federal Reserve, International Finance Discussion Papers Number 658 February 2000

[2] A marriage of inconvenience, the remarkable harmony between stocks and bonds. FTSE Russell, April 2023.

Figure 1 gives an idea of how low US stock-bond correlations were from the late-1990s to the Covid shock in 2020-21. Indeed, for much of this period the correlation coefficient was negative and was rarely above 0.2. The deflationary shocks that characterised the period — from the Asian / Russia / LTCM crisis of 1997-98 to the global financial crisis (GFC) in 2008-10 to the eurozone debt crisis in 2011-12- often drove the correlation strongly negative, as the chart shows.

Figure 1: Correlation of Russell 1000 and US 7-10 year Treasury returns since 1994
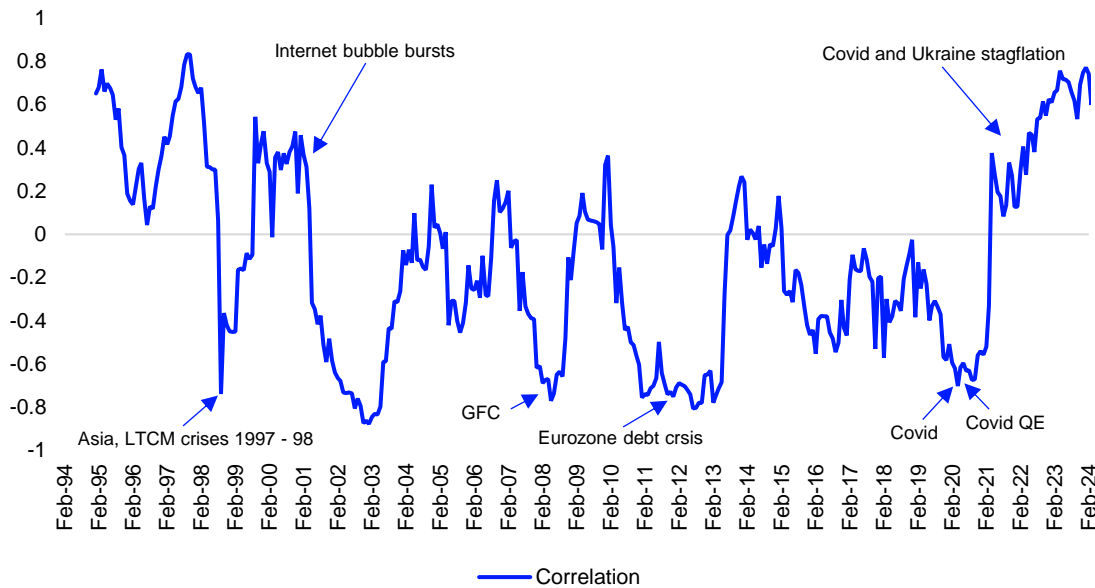
Source: FTSE Russell, data from January 1994 to May 2024. The chart shows the rolling 12 month correlation of daily returns of the Russell 1000 index and the FTSE Russell 7-10 year US Treasury index. Past performance is not a guide to future returns.

In Figure 2 we show the average correlation coefficients between the FTSE Russell 7-10 year Treasury index and the Russell 1000 index during three periods: between 2000 and 2008 (the "Goldilocks " era), the post-GFC era (2009-20) and the post-Covid period (2021-24).

Although the CAR barely changed in the post GFC era and remained largely negative, there was a sharp increase in the CAR after the Covid inflation shock developed in 2021-22. This raises a key question: why was the CAR so low (or even negative) pre-Covid?

Figure 2: US equity/bond correlations over three time periods post-2000

Correlations with Russell 1000	Goldilocks era	GFC to Covid	Post-Covid inflation shock
Period	2000-08	2009-20	2021-24
FTSE Russell US 7-10 year Treasury index	-0.32	-0.29	0.62

Source: FTSE Russell, monthly index return data from the following periods: "Goldilocks-era of 2000-08", "Great financial crash to Covid 2009-20",and "Post-Covid inflation shock 2021-24". The table shows the Monthly Pearson correlation coefficient in these periods, calculated using Monthly index data. Past performance is not a guide to future returns.

Why was the correlation of returns so low from 2000 until Covid?

Several factors help to explain why the correlation of returns between government bonds and equities was both relatively low and stable from 2000 to the outbreak of Covid in 2020-21.

Firstly, low inflation rates became embedded in G7 economies, helped by globalisation and low inflation in tradeable goods. Structurally low inflation meant that investors focussed on cyclical fluctuations in real growth and corporate earnings as the principal drivers of equity returns, as well as on nominal bond yields. In cyclical slowdowns, monetary policy easing by the Federal Reserve drove lower US Treasury yields (and superior bond returns). Conversely, equities outperformed during growth recoveries, while government bond yields increased.

Secondly, central banks adopted inflation targets, generally close to 2%, to consolidate low inflation rates and inflation expectations[3]. Thirdly, relatively high labour migration rates and labour supply elasticity meant Phillips curve trade-offs between unemployment and inflation became more favourable[4]. As a result, a very benign economic environment developed in the G7 (known as the Goldilocks era), during which growth and inflation were neither too hot nor too cold. The US saw stable and apparently predictable nominal GDP growth of about 6%, as Figure 3 shows.

Figure 3: US nominal GDP growth since 1995
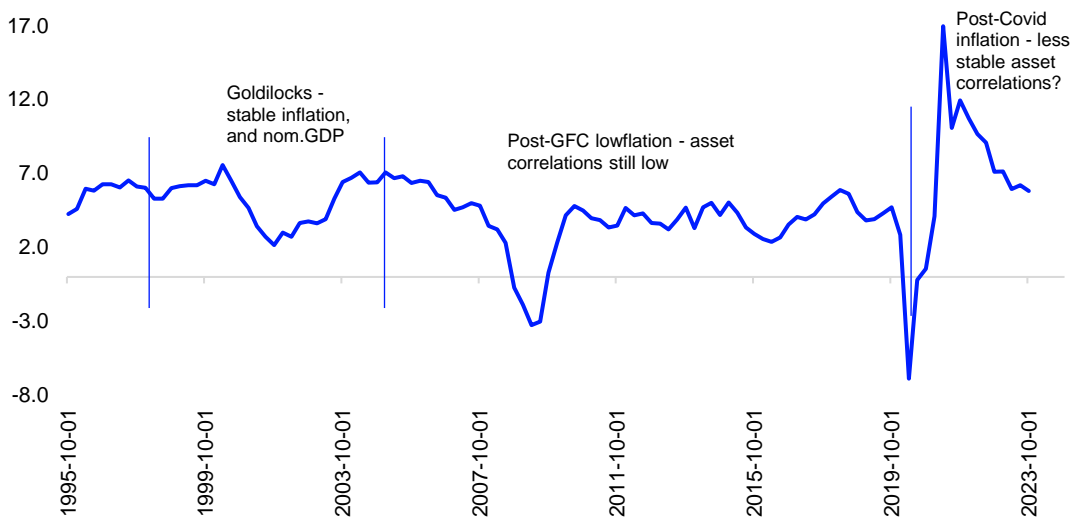
Source: US Federal Reserve. Year-on-year change in nominal GDP based on quarterly data, from Q4, 1995 to Q4, 2023.

The combination of these factors drove strong support for asset allocation models, like 60/40, or the so-called Norway[5] model, that are built on a 60% target weighting in equities and a 40% target weighting in bonds and credit. These models assume that bonds are reliable diversifiers for risk assets like equities, and that the relationship showing a low correlation of returns would persist. It is well documented that the Goldilocks era ended abruptly with the Global Financial Crisis (GFC) and the resulting global deflationary shock in 2008-09. Nominal GDP contracted sharply, as Figure 3 shows, and a deep recession unfolded. But despite the enormous macro-economic and financial uncertainty caused by the GFC, there was no structural break in the correlation of US asset returns during the 12 years that followed the crisis, with the correlation remaining close to -0.30.

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[3] The Fed did not adopt a formal (2%) inflation target until 2012,but had implicitly pursued an inflation target for some years before.
[4] "Has the long-run Phillips curve turned horizontal ?", C.Freedman, G.Harcourt & P.Kriesler, March 2016.
[5] "IMF survey: Norway's oil fund shows the way for wealth funds ", Delia Velculescu, IMF, July 2008.

Why did correlations remain low and stable?

Substantial market and policy cross-currents may explain why there was no structural break in CAR after the GFC. On the one hand, in the initial stages of the GFC, correlations briefly turned strongly negative, as safe haven flows into Treasuries drove yields towards historic lows, while equities sold off as the scale of financial dislocation became clearer. Corporate earnings and GDP growth expectations were also revised sharply lower.

There was enormous financial and economic uncertainty until the Fed implemented a zero interest rate policy (ZIRP) and quantitative easing (QE). Once the Fed embarked on this major monetary stimulus, equity and broader asset returns both recovered, and the correlation of US equity/bond returns reverted to the post-2000 mean near zero, as Figure 1 above shows. It is also important to note that inflation stayed low in the post-GFC era (removing an important factor in driving the higher correlation of returns, judging by the post-Covid era—see below).

In crises, investors rush into risk-free Treasuries and stock-bond correlations fall…

Figure 1 (above) also shows how the relatively low, but stable, CAR persisted until the aftermath of the Covid shock in 2020. **Deflationary financial and economic shocks like the Asian and LTCM crises, the global financial crisis, the eurozone sovereign debt crisis and Covid all caused a flight of capital into relatively risk-free government bonds, led by US Treasuries, and stock/bond correlations fell or turned negative as a result**. After 2008, a series of QE programmes from the Federal Reserve, combined with near-zero interest rates for much of the period, did help asset returns recover across a range of assets, raising the CAR, but correlations remained broadly stable between 2009 and 2020.

…and low inflation may also explain why correlation did not increase post-GFC

Given that QE works through several channels[6], including by raising risk appetite, the fact that the CAR did not rise further in the 2008-20 period (after the Fed introduced QE) is surprising, prima facie. However, low inflation may offer an explanation. Figure 4 shows US inflation rates and the past correlation of asset returns since 2000. **It suggests that there is a threshold level of inflation above which the CAR increases more sharply. However, at low inflation rates or after deflationary shocks, asset return correlations are much lower and drop sharply, with a greater focus on growth in the real economy and corporate earnings**.

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[6] See "The Effects of Quantitative Easing on Interest Rates: Channels and Implications for Policy ", Arvind Krishnamurthy, Annette Vissing-Jorgensen, Northwestern University, Brookings Papers, Fall 2011.

Figure 4: US inflation and bond/equity correlations before and after Covid
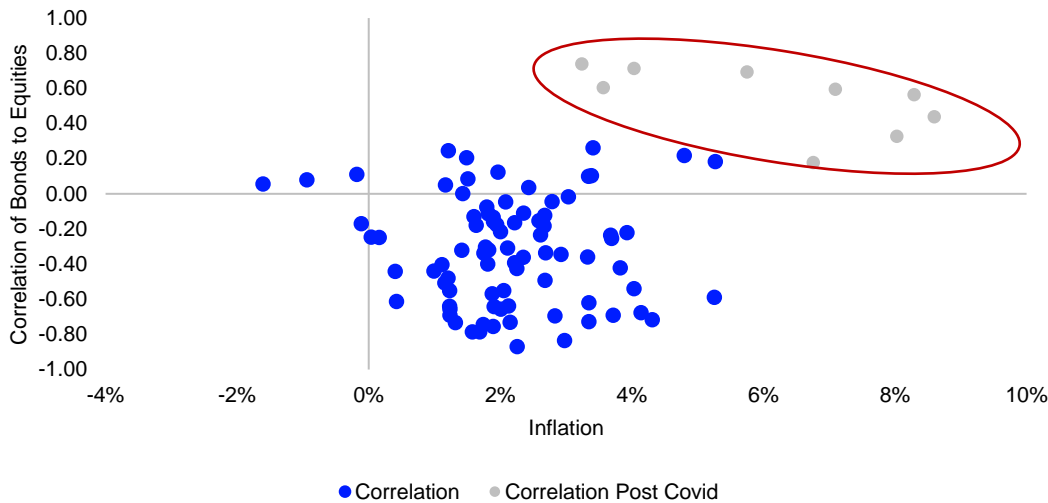
Source: FTSE Russell and Refinitiv-Datastream. The chart shows the relationship between US inflation and the correlation of US Treasury 7-10 year and Russell 1000 equity returns over the period from Q1-2001 to Q2-2024. Past performance is not a guide to future returns.

Higher stock-bond correlations tend to follow higher short rates and inflation

Figure 4 also suggests that the post-Covid inflation shock, together with the current "higher-for-longer" policy interest rates, may provide the best explanation for the rise in the correlation of asset returns since the end of the Goldilocks era, which was characterised by low and stable inflation and interest rates. Indeed, this observation is consistent with the **longer-term evidence showing that "higher stock-bond correlations tend to follow higher short rates and (to a lesser extent) higher inflation rates[7]"**.

The relationship between inflation and asset returns is non-linear

Another observation from Figure 4 is that **the relationship between US inflation and the correlation of returns is non-linear and unstable, particularly if inflation falls sharply below or rises above key threshold levels**. This would be consistent with higher inflation rates (or higher expected inflation) causing a risk premium to be applied to a wide range of asset classes (including fixed-rate government bonds, which offer no inflation protection).

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[7] "The stock–bond correlation and macroeconomic conditions: One and a half centuries of evidence", Jian Yang, Ying-gang Zhou, and Zijun Wang, Journal of Banking and Finance, April 2009

This was a feature of the Great Inflation of the 1980s, when financial asset returns were depressed by high inflation rates and yield curves generally carried a positive term premium for inflation protection.[8] In that regard, a flatter US government bond yield curve only emerged post-2000. The reduced term premium associated with a flatter yield curve was described as a conundrum by Fed Chairman Greenspan in 2005[9].

Generating expected correlations from asset class characteristics

What asset return correlations might be expected, given the underlying features of different asset classes? We exclude assumptions about the cyclical position of the economy and any related monetary or fiscal policy settings. In Figure 5, we extrapolate from the characteristics of the underlying asset classes to generate an expected correlation with the returns of equities.

Figure 5 suggests that various asset classes generate different expectations for the "normal" correlation of returns. For example, strongly risk-off assets like govt bonds, which have (virtually) no credit or default risk in local currency, could be expected to show quite different return and correlation characteristics from high yield (HY) credit, which carries higher default risk and could be deemed a risk-on asset. HY is also much closer to equities in the corporate capital structure.

This may help us assess whether a spike or structural break in correlations is likely to be explained by a change in macro-economic and financial conditions, or whether it simply reflects time-varying sampling volatility during a period of volatile returns (while the underlying correlations are constant).

Figure 5: Asset class structure and expected correlation of asset returns

Asset class	Type of risk asset	Interest rate & duration sensitivity	Inflation expectatn. impact	Growth impact	Monetary policy impact	Expected correlation of returns with equities	Notes on asset class
Conventional govt.bonds	Pure risk-off	Very high	High, negative	High and negative	Very high via rates	Low	Asset with no inflation protection
Inflation-linked bonds	Risk-off	Also very high	High, negative	High and negative	Also high	Low	Long duration - high rate sensitivity
Investment grade (IG) credit	More risk-off	High, particularly A+ credits	High, negative	High and negative, esp. A+	High but less than govt.bonds, apart from extremes (eg, QE)	Low	Rates key, due to low default risk
High-yield (HY) credit	Risk-on	Lower	High, but less, esp.to demand driven	High, via default risk	Variable-high at policy extremes	High	Growth may overpower duration
Hybrids (Prefs, Co-Cos, etc)	Risk-on	Low	High, but less, esp. to demand driven	High and positive	Variable-high at policy extremes	High	Financial cycle dominates, given issuers
Ordinary equity	Pure risk-on	Variable	High, but less esp. to demand driven	High and positive	Variable - high at extremes	N/A	Growth may overpower duration

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[8] See "Inflation and Asset returns ", Anna Cieslak and Carolin Pflueger, Working paper No. 2023-34, Becker Friedman Institute, University of Chicago, March 2023.
[9] Alan Greenspan, US Federal Reserve Chairman, February 2005 US Congressional Testimony.

Asset class	Type of risk asset	Interest rate & duration sensitivity	Inflation expectatn. impact	Growth impact	Monetary policy impact	Expected correlation of returns with equities	Notes on asset class
Commercial real estate	Risk-on	High	Some re-set inflation protection	High and positive	High	High	Growth and occupancy also key
Infrastructure	Neither?	Lower	High, but can be positive	Low	Less	Low but listed higher	More inflation protection
Commodities	Risk-on	Low	High and positive	High and positive	High	Variable	Oil shocks may dominate
Gold	Risk-off	No coupon so normally high	Variable. 2-way pull from rates	Positive	Variable-higher at extremes	Low	Rates and geo-politics key

Source: FTSE Russell. For information purposes only

Fixed income correlations are broadly in line with expected asset class characteristics

The correlations of returns of multiple fixed income sectors with US equities since 2000 are shown in Figure 6. The results are broadly consistent with the characteristics of the asset classes described in Figure 5. What is noticeable from the table?

First, government bonds show a notable post-Covid jump in correlations with US equities, with correlation coefficients switching from negative to strongly positive. Again, inflation-linked bonds moved from having little correlation with US equities to relatively high correlations. And investment grade credit showed significantly higher correlations with US equities after Covid.

In general, the broad leap in correlations after the inflation shock highlights the importance of higher inflation and Fed interest rate settings in driving asset class returns once tightening had begun in early-2022.

Figure 6: Fixed income sector correlations with Russell 1000 since 2000

Asset class	2000-2020	2021-2024
US 1-3 year Treasuries	-0.37	0.45
US 7-10 year Treasuries	-0.32	0.62
US 20 year+ Treasuries	-0.30	0.60
World govt bonds 7-10 years	-0.27	0.68
World govt bonds 20 year+	-0.24	0.71
US inflation-linked (TIPS) 7-10 years	0.04	0.77
World inflation-linked 7-10 years	0.23	0.77
US investment-grade credit	0.18	0.74
US high-yield credit	0.72	0.87
World broad investment-grade credit	0.19	0.78

Source: FTSE Russell, data 2000 to Q1 2024.

US HY credit retains highest correlation with equities

Significantly, US high yield (HY) credit already had a relatively high correlation with the Russell 1000 before 2020, so the period since then cannot be seen as a structural break or "regime change". However, the correlation still increases further and in fact US HY has the highest correlation with equities in both the pre- and post-Covid periods, confirming that the risk-on characteristics of HY bonds tend to dominate duration and overpower HY bonds' sensitivity to interest rates.

TIPS show higher correlation of returns with equities than conventional Treasuries

Figure 6 also shows the correlation of global government bond returns with Russell 1000 returns was higher than that of US Treasuries in the post-Covid era, reflecting the global nature of US large caps. Finally, US TIPS have a notably higher correlation of returns with equities than nominal US Treasuries in the higher inflation regime since 2021, consistent with their hybrid asset status (a fixed coupon but inflation protection for the bond's principal).

Nonetheless, we would note that a striking feature of the 2021-23 inflation shock was the underperformance of inflation-linked bonds (like US TIPS) because the impact of higher discount rates on the present value of these assets[10] dominated their overall returns. Turning to other asset classes, like credit, we find similar correlations of returns, but quite high variation in the correlations. There is evidence again of a structural break after 2020-21, but the correlations vary by asset class, according to the characteristics of the asset classes.

A "perfect storm" for correlations post-Covid?

Finally, the much higher correlations of returns since 2021 raise the question of whether a confluence of events, or "perfect storm" has driven higher correlations over the period? Figure 7 shows both the relative stability in asset returns and inflation pre-Covid and the instability since. After the initial sell-off in equities and the US Treasury rally when Covid emerged, the correlation of returns recovered strongly once the Fed cut rates to zero and adopted QE asset purchases (including credit) in 2020-21.

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[10] See " Time to trim the (inflation) hedges ?", FTSE Russell/LSEG, January 2023

QE, then inflation shocks drove correlations to new highs

As inflation rates then rose steadily in 2021-22, and the Fed began raising rates (in March 2022), asset returns in both equities and Treasuries fell sharply. This drove the correlation of returns higher after a brief dip in February/March 2022, as Treasuries rallied on the flight to quality after Russia's invasion of Ukraine.

Intriguingly, the correlation of returns persisted at high levels through most of 2023 as the Fed made clear it intended to hold rates "higher for longer", even if inflation rates eased. The risk rally and AI-related technology sector gains caused equities to outperform for much of 2023, but the Fed pivot towards easing policy in Q4 2023 drove both bond and equity markets higher, increasing the correlation of returns further. However, most recently, in 2024, continued equity market gains and falling bond prices have caused some decline in the correlation coefficient.

Post-Covid, correlations of returns have been higher, even with lower inflation

Figure 7 also suggests that the correlation of US stock/bond returns with inflation is not monotonic: correlations rose both when inflation increased in 2021-22 and during the disinflation in 2023-24. However, the dataset is limited to a short period and in Q1 2024 there were signs the correlation between US stock/bond returns and inflation may be falling.

Figure 7. 12 month rolling correlation of US stock/bond returns and US inflation rate

12 month rolling Correlation of Us stock/Reasury returns, and inflation
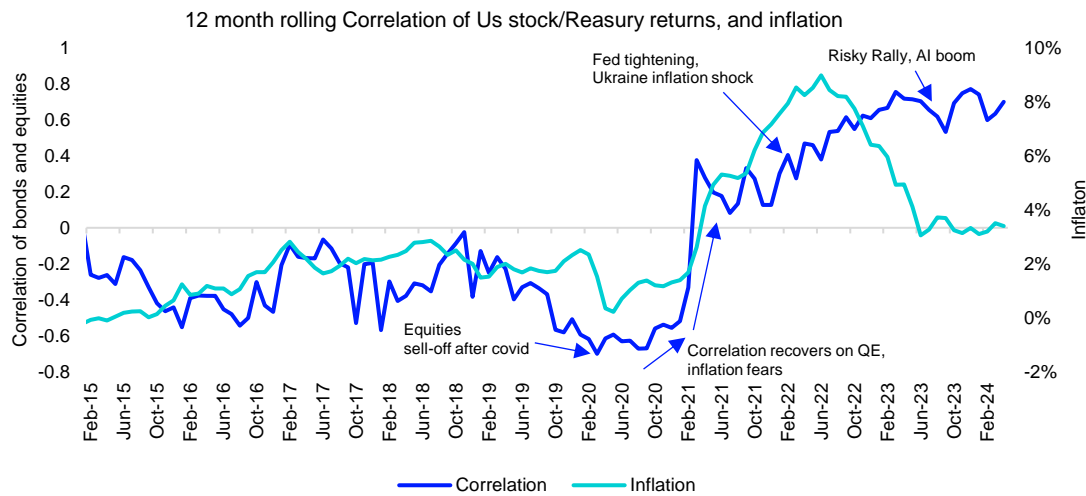
Source: FTSE Russell, Refinitiv. Data to end February 2024. Past performance is not a guide to future returns.

Conclusions and future research

– The persistence of higher correlations in the returns of multiple asset classes, and further evidence that the relationship of those correlations with inflation is both unstable and non-linear would pose a serious challenge for portfolio diversification

– Asset allocation strategies like the 60/40 "Norway" model have relied on relatively stable and low correlations in asset returns

– It is possible that correlations may fall back to pre-Covid levels as inflation declines, and that the continuing high correlations in 2023-24 have largely been driven by relatively high short interest rates

– However, more frequent portfolio re-balancing in itself may also cause greater instability in the correlation of returns

– Experience since Covid also shows that a stagflationary supply-chain shock (i.e., "bad inflation") may have a very different impact on the correlation of asset returns than the deflationary shocks that dominated the pre-Covid period (the GFC and eurozone debt crisis). Greater geo-economic fragmentation suggests that such shocks may become more, rather than less frequent

– In Part 3 of this Multi-asset research series, we will extend this analytical approach to asset classes outside the US, using the full range of FTSE Russell indices

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