

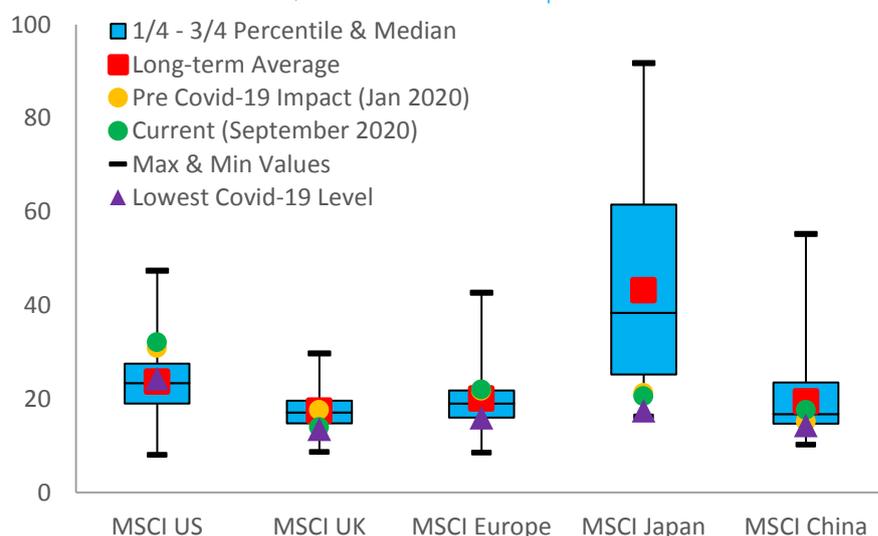


QIS Insights

CAPE and the COVID-19 Pandemic Effect

- In what has been a tumultuous period for financial markets due to the COVID-19 pandemic and the subsequent recovery, we take this opportunity to assess the Cyclically-Adjusted Price-to-Earnings (CAPE) ratios across five major equity markets, based on the principles of the CAPE ratio developed by Campbell & Shiller (1988).
- We review the current CAPE ratios to get a sense of where they currently stand, but given the low levels of interest rates across the five major economies, we also create an Excess CAPE Yield measure, defined as the CAPE yield above the 10-year interest rate yield, for each respective economy. We produce forecasts of returns for these equity markets and for the excess returns of equities above long-term bonds, respectively. We then compare the 10-year equity market forecasts with subsequent 10-year realised returns to assess the on-going efficiency of a CAPE-based equity forecast. Lastly, we examine sector effects across the five equity markets to shed some light on the drivers of the recoveries, and also specifically look at CAPE valuation effects across US sectors.
- We find that across the five equity markets the CAPE level has risen back by varying degrees to pre-pandemic heights. The US equity market, in particular, has had one of the quickest recoveries in history and remains the most expensive with its CAPE ratio above its long-term average whilst the others remain at or below their long-term CAPE averages.
- We also observe that whilst it remains vexing to some that equity markets have recovered so quickly (despite no vaccine having been found, as at the time of writing), charts of the CAPE ratios, the 10-year interest rates and the Excess CAPE Yield may go some way to explaining the equity market recoveries: With rates so low, the Excess CAPE Yield across all regions is almost at all-time highs, indicating that relative to bonds, equities appear highly attractive. From a sector perspective, the recovery across regions is universally being led by healthcare, technology and the communication services sectors which can partially be explained by a “work-from-home, if you can” narrative over this pandemic period.

Figure 1: Total Return CAPE Box and Whisker Plots for the 5 major Equity Markets, December 1981 – September 2020³



Source: Barclays, MSCI & Bloomberg

19th October 2020

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Introduction

Campbell & Shiller's Cyclically-Adjusted-Price to Earnings ratio (CAPE), is well-known to characterize the strong relationship between an inflation adjusted earnings-price ratio and subsequent long-term returns, as first highlighted in their 1988 paper "Stock Prices, Earnings and Expected Dividends". It has now become an often cited and followed measure of long-term equity market valuation.

In this paper, we specifically examine how the CAPE ratio has behaved over the COVID-19 pandemic period, referred to as the pandemic for shorthand hereafter, and we also extend our analysis beyond the United States (US) equity benchmark, to also look at the CAPE ratios for the United Kingdom (UK), Europe, Japan and China, to analyse the effect of the pandemic across the major equity markets globally.¹ We investigate the CAPE ratios of these equity markets relative to the respective long-term interest rates markets and develop a measure which may be revealing to understand the current demand for equities relative to the alternative of long-term bonds.

With the CAPE ratio now synonymous with long-term equity market valuations, its use as a tool to forecast equity market returns to form return expectations for the equities part of the portfolio is now relatively commonplace. As such, we show changes in such return expectations pre-pandemic versus current, across the regions, to highlight the impact of pandemic. An extension to this forecast was presented in Shiller (2015) where excess real returns of stocks over bonds were found to be influenced by both CAPE *and* real long-term interest rates, where this relationship had an R^2 of 0.41.² We therefore also extend the forecasts made to investigate the changes in excess real return of stocks over bonds pre-pandemic versus current, across the major equity markets to try and shed light on investors' strong preferences for equities over bonds during this pandemic.

Lastly, to dissect some of the driving forces of the respective equity markets over the pandemic, we look to sector dynamics within each respective economy. Edwards & Lazzara (2019) recently highlight the important role that sector dynamics can play in the returns of equity market country indices and as such, understanding these dynamics is especially important over the pandemic when comparing the relative performance of international markets.

Country CAPE Analysis

In the first part of this paper, we display CAPE ratios by MSCI Country Index to establish a baseline of where we are now and where we have been. In Figure 1 above, we illustrate the historical average, minimum and maximum CAPE levels with the 25th and 75th percentiles, to help readers gauge the range of valuations across the five largest equity markets globally.³

We construct our country CAPE ratios based on a Total Return CAPE (henceforth CAPE) which corrects for a potential bias coming from changes in corporate payout policy, as discussed in Bunn & Shiller (2014) and Jivraj & Shiller (2017). For brevity, we refer the interested reader to these papers for further details of the potential bias. We do however fully detail the construction of the CAPE ratios in the Appendix.

The United States CAPE ratio as of the end of September 2020, based on the benchmark of MSCI USA, is 32, coming back from a low of 23 in late March. In fact, the current value is now back to the recent high of 32 reached in January 2018 and thus has surprisingly retraced to the level prior to the pandemic. It is interesting to note that we have only seen two periods in available history where the CAPE ratio has been above 30, namely the 1920's prior to the Great

¹ For the original work related to the CAPE ratio, please see <http://www.econ.yale.edu/~shiller/data.htm>.

² This was for over the period from 1881 to 2014. For full details, see Shiller (2015), endnote chapter 11, number 22, page 315.

³ Our data for the CAPE ratios of the MSCI Country Indices is over the period from December 1981 to September 2020, except for China where we are only able to start the CAPE ratio from October 2004 due to availability of historical earnings and price data.

Depression and in early 2000 as the Nasdaq bubble peaked.⁴ Even during the 2007/2008 Financial Crisis, the CAPE ratio did not exceed 30. In fact, the current US CAPE ratio sits close to the 90th percentile of observations.

The historical average of the US (Total Return) CAPE ratio since 1881 is 17 and examining more recent history, in the last 20 years the average for the CAPE ratio has been around 25.6, so is slightly more elevated now. However, as US interest rates have never been this low, we posit that these low rates have something to do with the elevated CAPE ratio – we examine this in the latter part of this paper.

The CAPE ratio for the UK is 14 and for Europe it stands at 22. Since 1981, when we construct the CAPE ratios, the UK has averaged 17.6 whilst Europe is around 20. The UK is well below its long-run historical average, whilst European valuations are just above. The current CAPE of the UK has certainly been depressed due to the Brexit vote of 2016 and the sector make-up of the FTSE 100 (or equivalently MSCI UK, which is the UK equity benchmark we use in this paper), in addition to the impact of the pandemic.

The CAPE ratio for Japan stands at 20.6 and for China it is 17.7. Since 1981, the Japanese average is 42, but given that our data covers the Japanese bubble of the late 1980's, it is worth examining the median for Japan which is 38.4. As such, Japan is at extremely cheap levels by historical standards and is as cheap now as at any time over the last 40 years. China is interesting in that its CAPE ratio was below its long-term average, i.e. cheap, prior to the COVID-19 pandemic, whereas as of the end of September 2020, it is now just slightly below this average.

Throughout this paper the CAPE ratios of the various countries are mentioned and utilized in different contexts. We note that the equity markets of each country have different structural compositions, which can most easily be seen through their sector compositions, making direct comparisons between country CAPE ratios difficult. For example, the US has a significantly large technology sector at approximately 29% whereas technology has a weight of approximately 8% for Europe and in Japan it is about 12%. Given such seemingly structural differences in the nature and importance of valuations at a sector level on the country index, we caution on direct comparability of CAPE ratio across countries.

It is important to mention that whilst in this paper we're focused on the price effect from the pandemic on the CAPE ratios, fluctuations in earnings also have a role to play. We make two observations on this. Firstly, CAPE is based on the average of the last 10 years of (inflation-adjusted) earnings, thus naturally muting the immediate impact of the effect of sudden earnings changes on CAPE, *unless* there are continued outsized changes, as we saw during the 2008 Global Financial Crisis. The second observation therefore, is that it is likely too early to gauge the impact of decreases in corporate earnings, as we currently only have one full set of quarterly earnings since the pandemic has started. The intuition is clear though: If earnings globally do continue to decrease sharply, given the price recoveries we are seeing in most major economies, CAPE ratios may be set to increase even further, which would imply that current market prices relative to long-term earnings would become extremely inflated, at least by historical standards.

Country CAPEs versus Long-term Real Interest Rates

Whilst the US CAPE ratio has reached elevated levels, some market commentators have noted the role of interest rates in pushing up CAPE ratios or even using the low level of interest rate levels to justify high CAPEs. Traditional theory notes that interest rates are a key component used in equity valuation models. When interest rates fall, the discount rate used in the model thus decreases and the price of the equity asset should appreciate. This assumes that all other model inputs stay constant. So, as we have seen central banks cut interest rates, this may be used to justify higher equity levels and stretched valuations. Shiller (2015) finds that equity returns are influenced both by the CAPE ratio *and* by an estimated real long-term interest rate. The other corollary of this is that bonds look extremely unattractive and are very highly valued, also driving investors into equities.

⁴ Note that in this paper, any observations made of the CAPE ratio based on data outside of our data range, e.g. the 1920's, is based on data available from Professor Shiller's website link noted in Footnote 1.

To examine this macro puzzle, we first plot as far back as possible, the CAPE ratio, the long-term real interest rate and also a new measure called the Excess CAPE Yield for each respective economy.⁵ This new measure is simply defined as the inverse current CAPE ratio minus the current 10-year real interest rate, which formulaically is:

$$\text{Excess CAPE Yield}_t = \frac{1}{\text{CAPE}_t} - 10 \text{ Year Real Interest Rate}_t$$

By comparing CAPE ratios and long-term real interest levels, we highlight the current extremes in the macro-economy. We note for all regions interest rates are at historic, unprecedented lows while CAPE ratios have largely risen since the low levels reached in March 2020. As such, we think that the Excess CAPE Yield is a useful way to consider the interplay of long-term valuations and long-term interest rates. In fact, the Excess CAPE Yield can be an alternative way to think about the equity market premium, as we explore below.

In Figure 2, we graphically display the CAPE ratio, the 10-year real interest rate and the Excess CAPE Yield. We display these for 40 years, except for China where our data does not go back that far. This enables a long run comparison on equity valuations, rates, and the interplay between them. The graphs also provide some historical context for real interest rates – they have been largely getting steadily lower and in all but China, they are currently negative.

There are some striking observations to be made. The Excess CAPE Yield is relatively high across all regions and is in fact getting close to all-time highs in several regions. The other time that the Excess CAPE Yield was at these levels was back in the 1980s when interest rates were high, but so was (expected) inflation, thereby diminishing the real returns of long-term bonds. This made them a riskier investment versus equities, hence driving up the demand for equities. This is similar to what we are observing now, but this time in the context of extremely low interest rates and (expected) inflation.

We think the Excess CAPE Yield could be one tool used to explain investors' current strong preference for equities – equity returns, and indeed excess equity returns potentially available to investors over bonds are high and still attractive relative to other times in history. Thus investors may believe equities can offer better potential for positive real returns over the next best risky-alternative of long-term bonds.

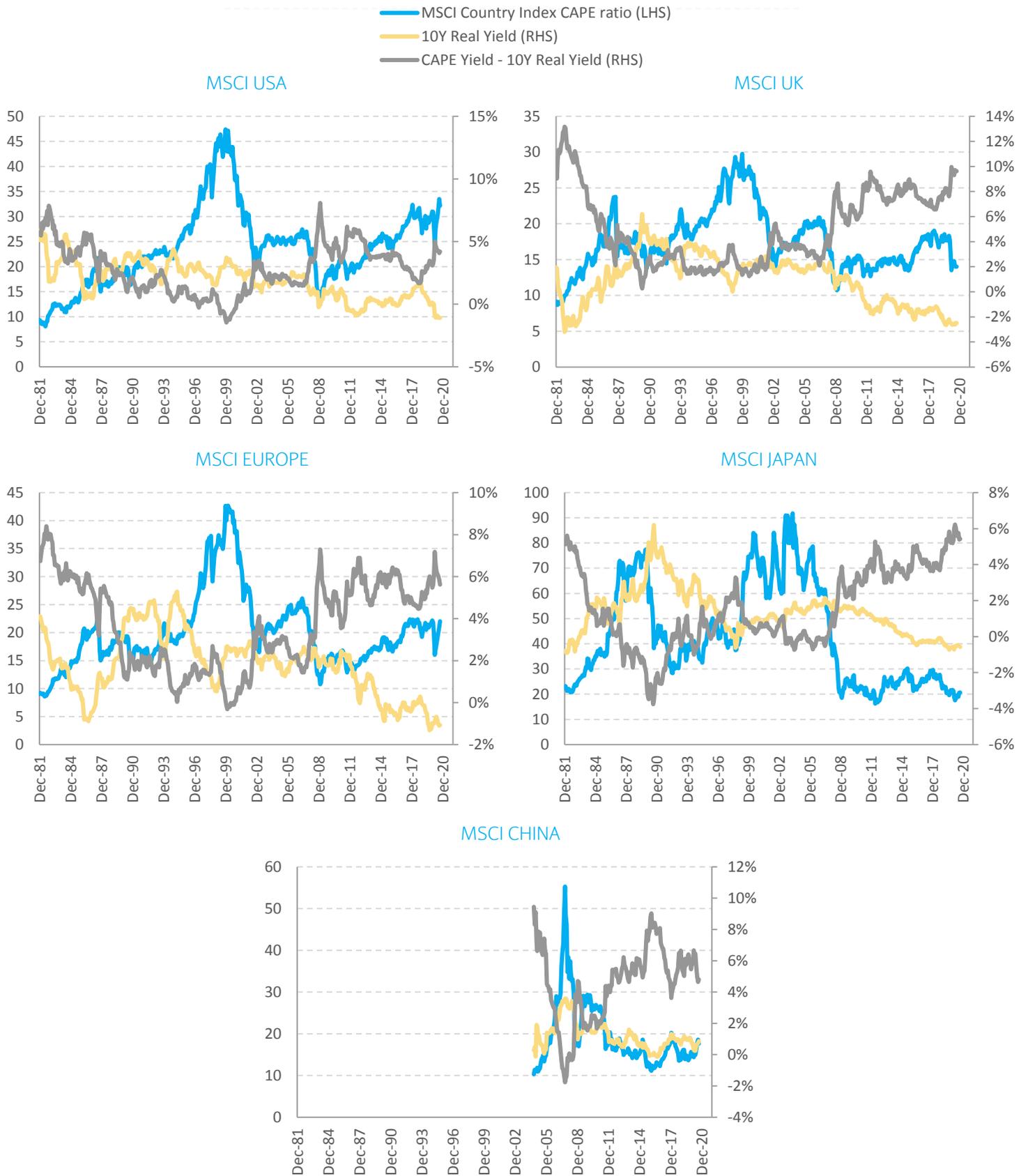
We had expected this Excess CAPE Yield to be close to its all-time highs, given that interest rates are now exceptionally low, however one surprising region is the US, where the ratio is not at its peak but in fact peaked in 2008. This is most likely as a result of the CAPE ratio dropping further in 2008 than what we have seen thus far in this pandemic.

The UK has a high Excess CAPE Yield at almost 10% highlighting the UK equity markets potential attractiveness driven by its relatively low CAPE ratio coupled with low rates. This potential premium is the highest it has been in the last 4 decades and is at an even higher level after the Great Financial Crisis in 2007/2008. The Excess CAPE Yield levels are also elevated for Japan and Europe. For Japan this might be as expected as Japanese rates have been so low for so long, and with equity valuations at the bottom of the range, the time for Japanese equities may be a foot. China on the other hand, does not seem to be effected in the same way from the pandemic as other economies have been. This may be due to a timing effect given that COVID-19 started in China and has subsequently been controlled well after the initial surge, which has had positive implications for their economy.

In summary the Excess CAPE Yield across all regions is at their highs indicating that relative to bonds, equities are looking highly attractive. However, the monetary and fiscal stimulus we have seen from Central Banks and the cutting of interest rates is fighting against the currently unknown financial implications of the pandemic – this is unique in history with many unknown consequences, and as such it is now not unfathomable that interest rates may indeed go even lower.

⁵ We calculate a real long-term interest rate through subtracting the average actual inflation rate over the preceding ten years from the 10-year bond yield as followed by Shiller (2015). We acknowledge that one should use an ex-ante real interest rate, i.e. the nominal rate minus *expected inflation*, however such an approach comes with additional challenges for the availability and nuances of expected inflation data, as discussed in Campbell, Shiller and Viceira (2009), which is beyond the scope of this paper.

Figure 2: Comparison of CAPEs versus Long-Term Real Interest Rates Across 5 Major Equity Markets, December 1981 – September 2020



Source: Barclays, Bloomberg & MSCI.

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Expected Returns Forecast in Light of the Pandemic

Forecasts of expected returns based on the CAPE ratio were first developed by Campbell and Shiller (1988). Given the strategic asset allocation need and importance of expected return forecasts, and revising such forecasts when significant macro-economic events occur, we produce a term structure (2-, 5- and 10-year horizons) of expected return forecasts based on the CAPE ratio for four of the five economies in our study. We exclude China from this analysis given the lack of available data needed to generate reasonable accuracy for the forecasts.

Given that interest rates are unusually low by historical standards, we also produce another forecast first motivated by Shiller (2015) of the excess equity returns over interest rates, where the level of the CAPE ratio as well as the prevailing real level of long-term interest rates is accounted for. Given the current interest rate environment and the projection of such, we think that the inclusion of an interest rate factor in the valuation of equities has become an important facet to consider - equities should no longer be valued in isolation anymore.

Forecasting Equity Returns

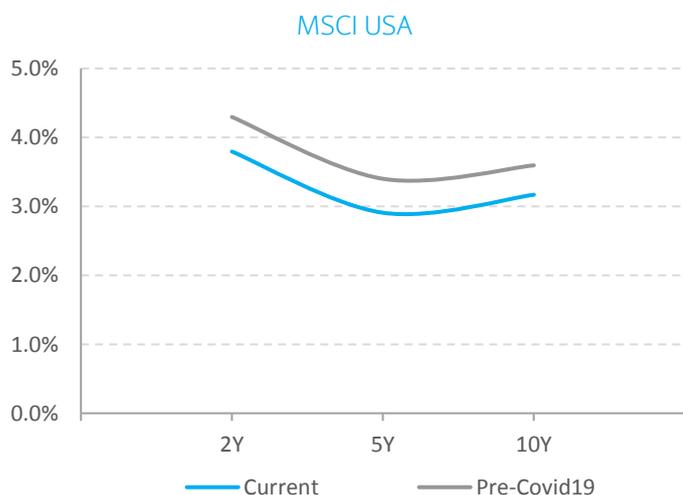
Figure 3 below shows the term structure of forecasts for the two CAPE-based model forecast approaches – their regression equations being shown at the top of the table for Panel 1 and Panel 2 respectively. We use an Ordinary Least Squares (OLS) estimation for the coefficients based on the available data, and then use CAPE and real interest rate values from our forecast date, i.e. pre-COVID19 (January 2020) and Current (September 2020), to obtain our forecasts of expected returns.

Unsurprisingly and as can be seen from Panel 1, the forecasted returns for the UK is higher than prior to the pandemic, the US and Europe are lower given their rapid recoveries and Japan now remains unchanged. The UK has the largest difference pre-COVID19 and current, as it has been the slowest to recover. In fact, as its CAPE level is below recent averages and somewhat on the cheaper side, the expected returns have risen significantly in the short term due to the UK equity market fall. The US and Europe are still positive but lower than prior to the pandemic as they have seen a fast retracement since the lows in March.

Figure 3: CAPE-based return forecasts across 4 major equity markets, December 1981 – September 2020

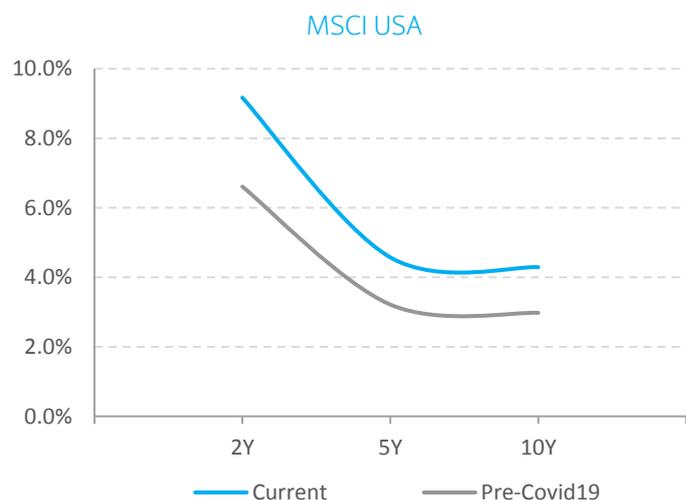
Panel 1: Expected Real Equity Returns

$$\text{Real Returns Equity}_{t+k} = \alpha + \beta_k \frac{1}{\text{CAPE}_t} + \epsilon_{t+k,k}$$

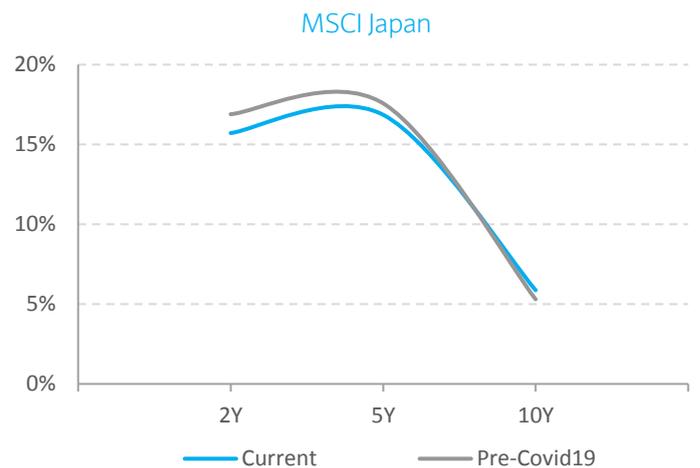
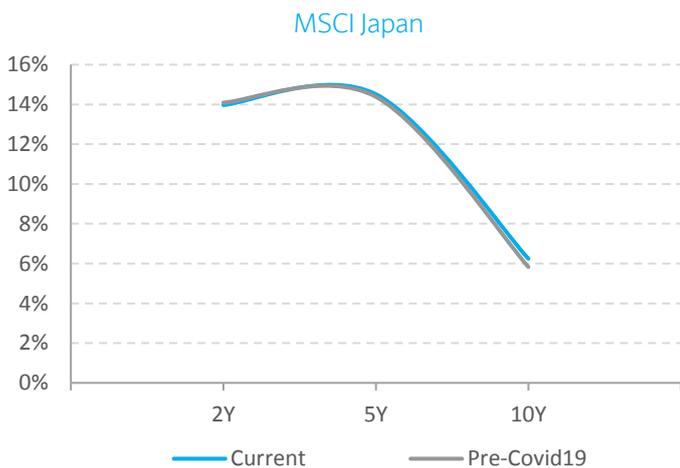
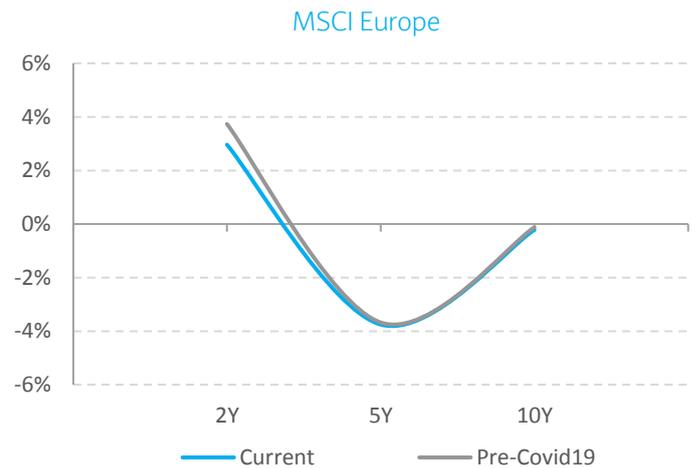
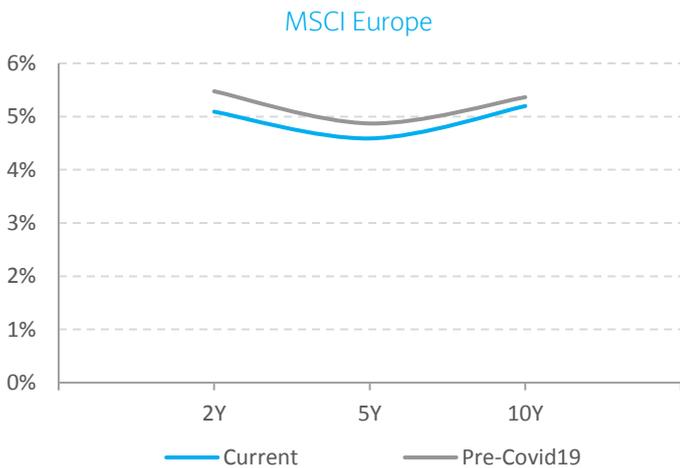
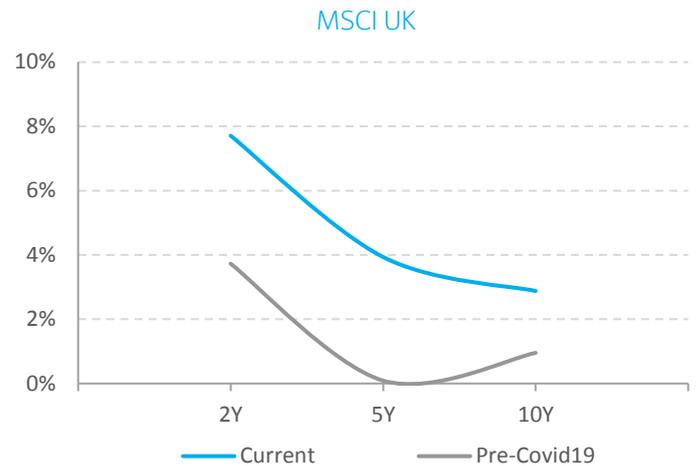
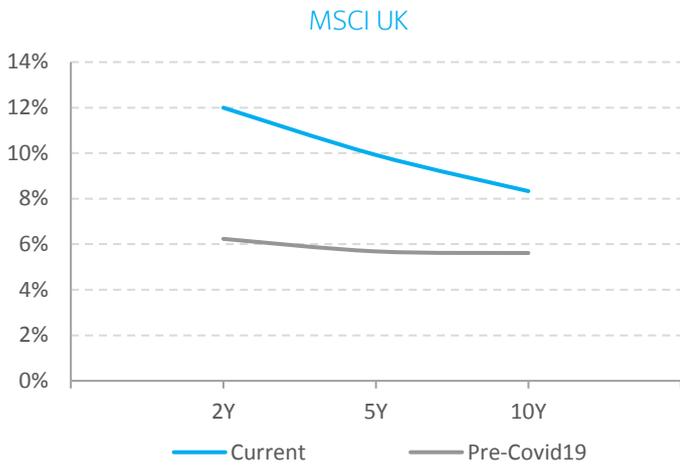


Panel 2: Expected Excess Real Returns of Equity over Long-Term Bonds

$$\text{Real Returns Equity}_{t+k} - \text{Real Returns 10Y Bonds}_{t+k} = \alpha + \beta_{1,k} \frac{1}{\text{CAPE}_t} + \beta_{2,k} \text{10YRealYield}_t + \epsilon_{t+k,k}$$



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Source: Barclays, Bloomberg & MSCI.

Forecasting Excess Equity Returns Over Bond Returns

Panel 2 reveals further insights when including an interest-rate component into the forecasting model. It can be seen particularly in the US and the UK that the current forecast of excess real returns of equity over bonds has widened since the beginning of the pandemic. Such an observation is revealing of an increase in attractiveness of equities over bonds. Whilst this is somewhat expected in these regions given the collapse in real interest rates since the advent of the pandemic to extreme lows, it is surprising to still observe this relative attractiveness in the US which has already seen a strong recovery in its equity markets, whereas the UK is very much the laggard.

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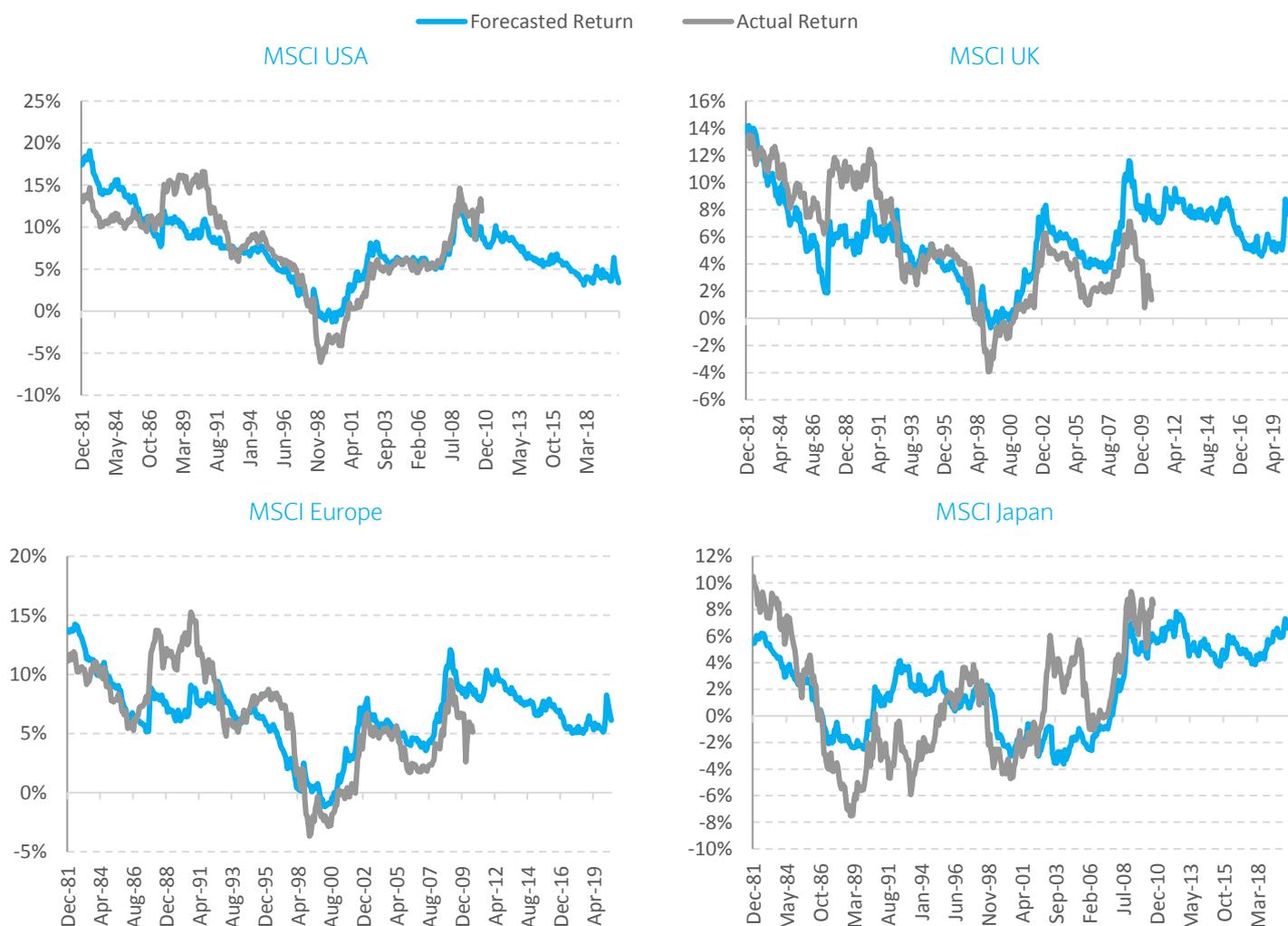
The significant widening of the forecasts in the UK is notable, especially at the short end. We posit that this widening is due to the interplay of both the low level of the CAPE ratio and the low level of real interest rates. The UK has seen the biggest change and widening in forecasts as the UK has had large changes in both variables – both the CAPE and 10-year real yield – whereas for the other regions such as Japan and Europe, they had low real rates pre and post the pandemic and their CAPE ratios are large back to pre-pandemic levels.

In summary, investors expect a certain return in equities as compensation for investing in a riskier asset class, and as interest rates have declined, the relative expected return for equities has increased dramatically. We believe this may quantitatively help to explain investors current preference for equities over bonds, and as such the quick recoveries we are observing (with the exception of the UK), whilst still in the midst of a pandemic. In the US in particular, we are once again observing stretched valuations and high CAPE ratios compared to history.

In-Sample Return Forecasts versus Actual

In the same spirit as Siegel (2018), we produce graphs of an in-sample forecasted returns using the alpha and beta coefficients from the entire time-series and actual subsequent returns.⁶ We plot these to try and validate a CAPE-based model forecast and understand their long-term potential to be accurate.

Figure 4: CAPE-based 10-Year Forecast of Real Equity Returns versus Actual Returns, December 1981 – September 2020



Source: Barclays, MSCI and Bloomberg.

⁶ We use in-sample data to avoid the issues of small sample sizes and autocorrelation in early data points.

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From Figure 4 we find that the plots of the forecasted returns are interesting for their accuracy to realized returns – the correlation of forecasted returns to realized returns is 75% on average across regions. This highlights the efficacy of the CAPE ratio for forecasting returns across regions.

We interestingly note that the forecasts seem to deviate with realized returns around key macro events. For example, around Black Monday on 19th October 1987, again they deviate in the late 1990's and early 2000 around the Nasdaq bubble and again we see some deviations around the Great Financial Crisis of 2007/2008. However, this does not detract from the accuracy of the forecasted to realized returns as can be clearly seen.

Sector Effects

In order to further understand some of the drivers in equity market performance during the pandemic, we look at the underlying sectors dynamics. These play a critical role in the returns of equity market country indices, and especially in the relative performance of these international markets. Edwards & Lazzara (2019) find that sector level effects on the aggregate market index have increased through time since 1990 when the sector level impact was approximately 25%, increasing to around 40% more recently. Such a sector level impact has been accentuated over the pandemic and we demonstrate the winners and losers through unpacking their year-to-date performance attribution for the five international equity markets, as shown in Figure 5.

Year-to-date, at the aggregate market level, it is evident that most countries have staged some form of a recovery from the lows during the month of March, in part as a result of the stimulus programs from the respective central banks across the globe, but there is some dispersion in the stage of this recovery as can be clearly seen from Figure 5. The US and China are firmly back in positive territory, whilst the other markets have not fully erased the losses year-to-date and with the UK in particular, being the worst of the pack, having only recovered half of its drawdown of 40%.

From a sector perspective, industrials, energy and the finance sectors universally suffered across all regions, highlighting some of the commonalities in investors reactions to the onset and continued impact of the pandemic – these sectors have been particularly bad for the UK, Europe and Japan. Healthcare is the sector that has unsurprisingly performed well across regions, as it is likely to be one of the main beneficiaries from the implications of the pandemic. As such, healthcare sectors across all regions had some of the lowest drawdowns versus the other sectors and have been positive contributors over the recovery period. Lastly, given the ongoing nature of the pandemic, a growing narrative of “home improvements” whilst individuals spend more time confined at home, has led to the improving performance of the consumer discretionary sectors across regions with the sector in the US and Chinese markets already being a positive contributor year-to-date.

The US market stands out for several reasons. The US market recovery has mainly been driven by the exceptional performance of the technology and communication services sectors. This performance has been driven by the “work from home” narrative which has favoured technology enabled companies through their products and services facilitating virtual communication and online working under lockdowns. Secondly, on a relative comparison basis, the size of the US technology sector and to a lesser extent the communication services sector is evident in the US recovery performance whilst the relative lack in size of the technology sectors in the other regions is striking. The UK technology sector is especially small and is perhaps one of the reasons why this market has not recovered as well as the other regions.

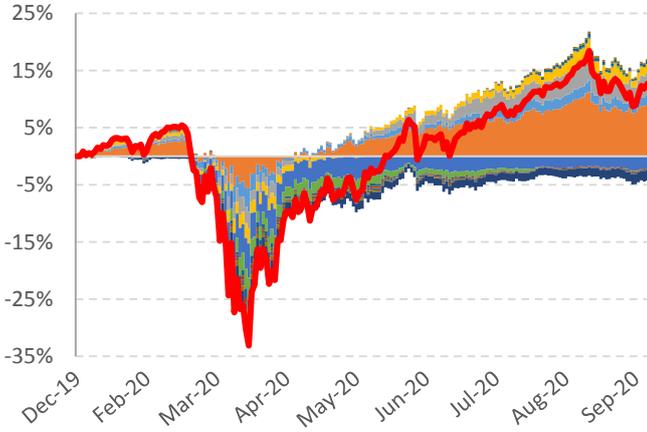
Sector dynamics of the Chinese equity markets are similar to the US, in that technology, communication and home improvement related companies have mainly led the recovery. As such it comes as no surprise that the company with products and services across these areas is in the consumer discretionary sector, i.e. Alibaba. It is this sector, followed by communication services and then technology/healthcare that have driven the strong performance since March 2020, accompanied by a continuing decrease in the transmission of COVID-19.

Whilst sector performance attribution is no doubt interesting, understanding sector valuations both on a standalone basis and relative to the other sectors (in the cross-section) is just as important. In Figure 6 we display some valuation statistics of the CAPEs for the US sectors. The first observation is that there is a wide dispersion in the level of the CAPE ratios across sectors. This is because sectors are distinctly different and exhibit long term structural differences.

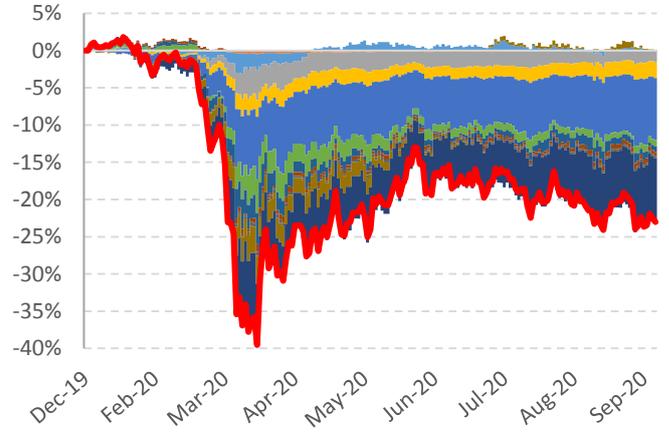
Figure 5: Sector attribution for each MSCI Country Index, 31st December 2019 – 30th September 2020



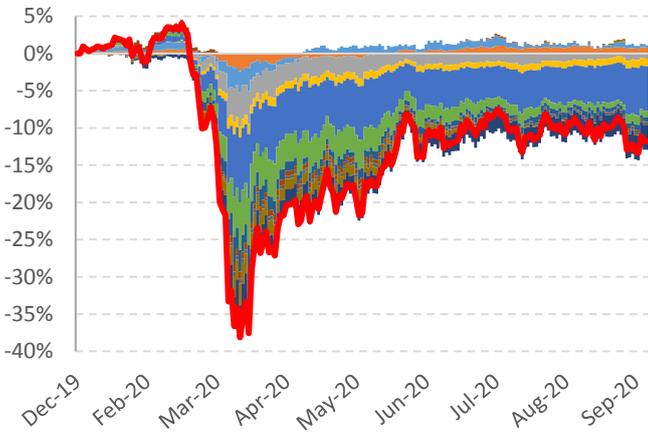
MSCI USA



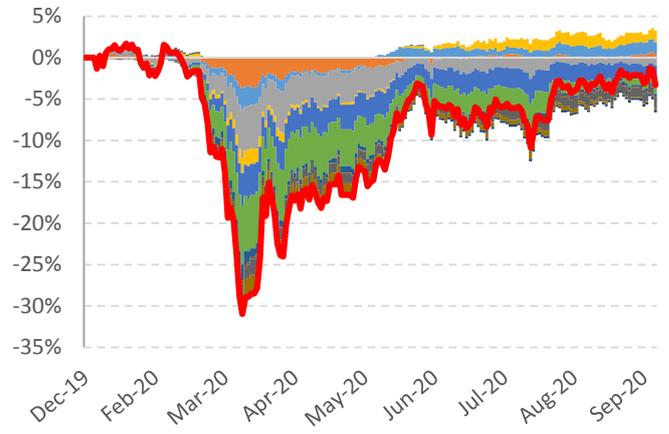
MSCI UK



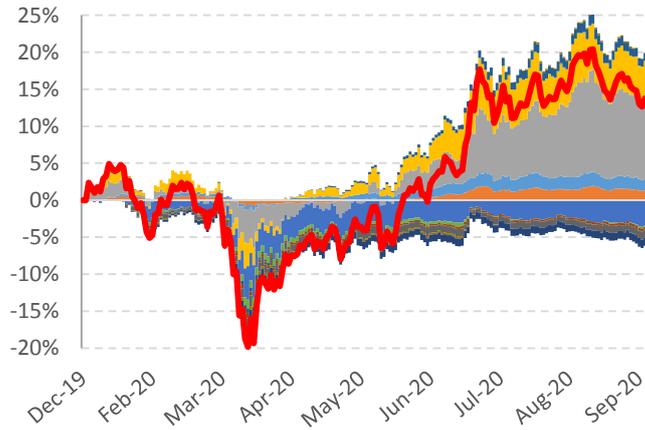
MSCI Europe



MSCI Japan



MSCI China



Source: Barclays, MSCI and Bloomberg

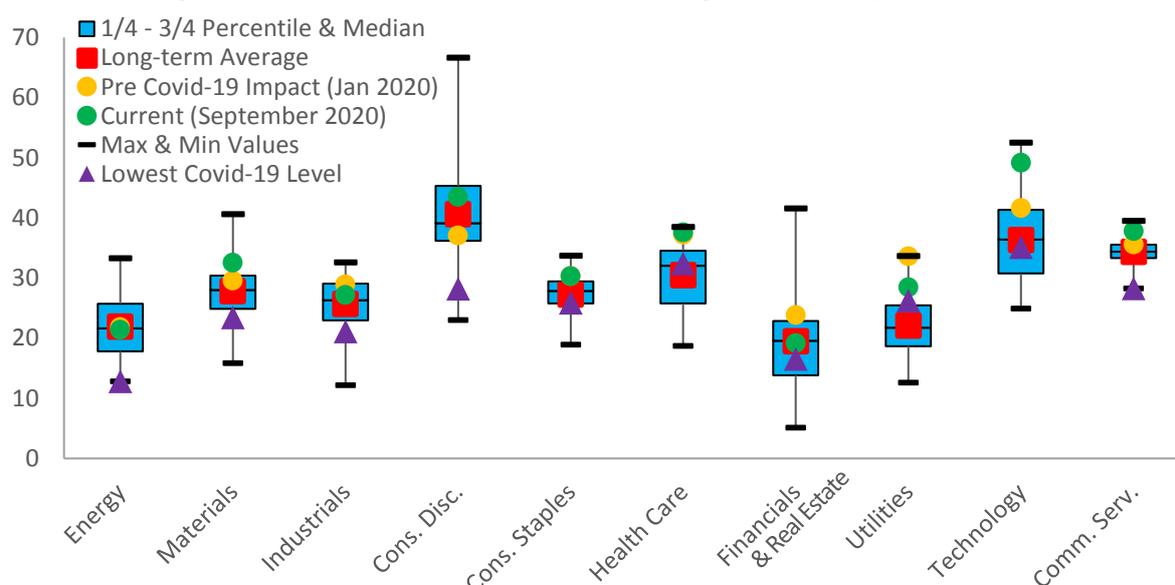
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As such, investors have been willing to pay higher multiples for growth stocks and this is exhibited by the current high CAPE ratio of the technology sector. On the other hand, the utilities sector is more of a stable and highly regulated sector with less growth characteristics and hence typically lower CAPE ratio levels.

These structural observations are also true of *the range* in CAPE ratios achieved. Given the profiles of the utilities and consumer staples sectors, we see that they have a relatively tight dispersion while consumer discretionary has a wide range of CAPEs, given the large elasticity in demand for discretionary products. More recently, the US technology sector has seen a high degree of variability. It initially started the year with a CAPE of 40 and as of the end of September it was 50. As can be seen from Figure 6, such a quick recovery in valuations may be one of the reasons for the breakdown in performance of the technology sector during the month of September.

Such observations of over-valuation or under-valuation are also important in the context of relative valuation between sectors. Cross-sectional valuation is an important feature of sector effects and whilst a deeper analysis is beyond the scope of this paper, we refer the interested reader to Bunn et al. (2014) and Jivraj & Wei (2018), which details a sector rotation strategy based upon the CAPE Ratio, to harness a value premium from the universe of sectors.

Figure 6: CAPE ratio for the US GICS sectors, August 2002 – September 2020



Source: Barclays and Bloomberg

Conclusion

In this piece we investigated equity valuations through the lens of CAPE and the effect of the COVID-19 pandemic for the US, UK, Europe, Japan and China. We found that these equity markets are at different stages of their recovery to pre-pandemic levels after the sharp falls in March 2020, driven by an overreaction and fear of the unknown implications of the pandemic. This recovery has been one of the quickest in history, especially for the US. For example, the US CAPE ratio fell to 23 from 31 in January 2020 and recovered back to 32 in September 2020. Europe, Japan and China all experienced a similar trajectory, whilst the UK has been the laggard in its recovery with its current CAPE ratio not much further away from the low of 13.5 achieved in March 2020.

With the pandemic expected to have a severe economic impact on countries and with still no certainty of a vaccine for the virus, it is curious and vexing to some that equity markets have recovered so quickly, particularly in the US. This is a critical question for many, as to whether this equity market recovery is justified or not? As such, we developed a measure of Excess CAPE Yield to potentially capture some insight into investor behaviour and the resulting strong preference for equities. To understand this, we used the CAPE ratio in a familiar context, to forecast equity market

returns based on a predictability regression estimated on long term data and subsequent returns. Additionally, and new to the literature, we also produced forecasts of excess equity returns over bonds, as it is important to consider the extremely low level of interest rates and uniquely, we examined the role of this dynamic across the term structure of expected excess returns.

We found that the Excess CAPE Yield is close to its high across all regions, indicating that relative to bonds, equities appear highly attractive and the potential excess returns available to equities may be high. In most regions the Excess CAPE Yield is even higher than the Great Financial Crisis of 2007/2008, driven by the extreme low level of interest rates, that we now see coupled with CAPE levels mostly around long term averages.

As for forecasted equity returns, they have all risen except for the US, given that the US CAPE ratio is now at its pre-COVID level. With respect to forecasted excess equity returns over bonds, it is clear that the term-structure has widened in the short end as a result of the pandemic, most noticeably in the US and the UK. This reflects their cheapening valuations as well as the low or even negative returns bonds may produce going forward. The term structure has remained relatively stable for Europe and Japan respectively. Their valuations have recovered or exceed their pre-pandemic levels, with the US remaining somewhat expensive and Japan remaining somewhat cheap.

We believe the Excess CAPE Yield, forecasted equity returns and excess equity returns above bonds may quantitatively help to explain why investors have sought equities after the initial pandemic rout. The extreme differences between the CAPE ratio and the low level of interest rates have decisively shifted investors preferences towards equities and all three metrics highlight this impact.

To highlight the accuracy of our approach used in forecasting equity returns, we plotted the in-sample forecasted 10-year returns versus actual subsequent realized returns, for each of the regions respectively, showing the strength of the CAPE ratio and its ability to predict 10-year returns, with the average R-squared being ~70%.

Finally, as Edwards & Lazzara (2019) note, sector dynamics now play an increasing role in driving equity markets. As such, we plotted the sector returns by their weight for each respective equity market. Industrials, energy and the financial sectors have suffered disproportionately and were consistently some of the worst performers across all countries. Healthcare is the sector that has unsurprisingly and universally performed well across regions, as it is likely to be one of the main beneficiaries from the implications of the pandemic. The US and Chinese market recoveries have mainly been driven by the “work from home” narrative. This narrative has favoured technology enabled companies through their products, online retailers and home goods suppliers. Notably the UK, Europe and Japan have smaller technology and communication services sectors that have likely hampered their recovery.

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Appendix

As a start, we obtain country-level earnings, price, and total return index levels from MSCI and country-level CPI data from the respective National Statistics bodies for each region.

Use of Total Return Price Series

We follow the approach of Bunn & Shiller (2014) to use a total return time-series based on end-of-month observations. These time-series represent the value of the portfolio when dividends are reinvested into the portfolio as of the end of each month. The total return price index level thus evolves according to:

$$PTR_{t+1} = PTR_t \times \frac{P_{t+1} + D_{t+1}}{P_t}$$

Where PTR_t and P_{t+1} are the total return price and price index levels at the end of months t and $t + 1$ respectively and D_{t+1} denotes the dividend series at the end of month $t + 1$, which is the payment which accrues during the month $t + 1$. This being said, the total return price index level is obtained directly from MSCI.

Inflation Adjustment

Next, in order to inflation-adjust our series, the total return price index level is adjusted for inflation based on the respective CPI level at the time where for our analysis the common price (“real”) level refers to September 2020.

Scale Adjusted Earnings per Share

Price Return CAPE (henceforth PR CAPE) is based on dividing an inflation-adjusted price by the 10-year average of inflation-adjusted earnings per share. Thus, in order to preserve the informational content of a TR CAPE ratio, when replacing an inflation-adjusted price with an inflation-adjusted total return price for the numerator of TR CAPE, the denominator will also need to be scaled accordingly. For a full discussion, refer to Bunn & Shiller (2014) but for brevity sake, the scaled earnings are calculated by the ratio of the total return price to the price return:

$$E^{scaled} = E^{original} \cdot \frac{P^{TR}}{P^{PR}}$$

Construction of CAPE Time Series

Finally, we construct our monthly time-series of TR CAPE ratios based on the month-end real total return price index, divided by the average of 10 observations of the scale-adjusted (12-month trailing) earnings per share before extraordinary items.

Readers of this should note two things. Firstly, as discussed in Campbell & Shiller (1988, 1998), the motivation for the use of 10 years of earnings is to mitigate the effect of earnings variability through extending the valuation horizon beyond on average business cycle. Secondly, the use of an income statement measure without the inclusion of extraordinary items which excludes various accounting nuances has been discussed in Jivraj & Shiller (2017).

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