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QIS Insights

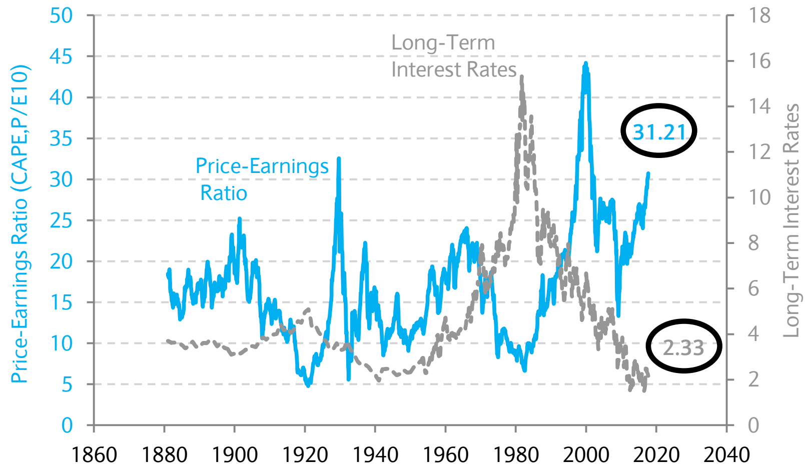
The Many Colours of CAPE®

"The main insight with CAPE is not that it is a "value" signal, there are plenty of value signals that are possible. It is that it is a good measure of under or over-pricing, whereby even if earnings are decreasing or going to collapse, there will be a price and CAPE allows us to assess if it's under or over-priced. You can still expect positive returns from a stock if its earnings are collapsing as long as it is clear that it is underpriced now, relative to where it should be priced."

Robert J. Shiller

- Campbell & Shiller's Cyclically-Adjusted Price to Earnings ratio (CAPE®) has both its advocates and critics.[1] Currently, the debate is on the validity of the high CAPE ratio for US stock markets in forecasting lower future returns – CAPE is currently at 31.21.
- We investigate the efficacy and validity of CAPE from several different perspectives:
  - First, we run multiple-horizon predictability regressions for CAPE versus its peers:
    - We find CAPE consistently displays economic and statistical significance far better than any of its peers.
  - Second, we explore alternative constructions of CAPE based on other proxies for earnings motivated by the work of findings of Siegel (2016) using NIPA profits:
    - Original CAPE is still best when comprehensively and fairly reviewing the other proxies, even for NIPA profits.
  - Third, we assess how to practically use CAPE in both an asset allocation and relative valuation setting:
    - We demonstrate a novel use of CAPE for asset allocation programmes as well as discuss relative valuation exercises for country, sector and single stock rotation.

Figure 1: Long-term history of the US cyclically adjusted price-earnings ratio (CAPE) and 10-year US Treasury yield, January 1881 – September 2017



Source: Prof. Shiller website[2]

[1] Throughout the article, the use of CAPE is synonymous with CAPE®
[2] http://www.econ.yale.edu/~shiller/data.htm

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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 a result, it has now become an often cited measure of equity market valuation.

With such a status, the current value of CAPE, 31.21, is causing concern amongst investors and spurring debate amongst academics – it is currently in its 96th percentile compared to its own history since 1881. Thus, the question of whether the US stock market is overpriced, is being hotly contested and CAPE is at the centre of this debate.

starting level, by deciles, we're in the worst possible bucket where on average subsequent annualised real returns over the next ten-years were a mere 0.9%, with the best case being a not so bad 5.8% but the worst case being a very bad -6.1%.[3]

Such analysis which was first presented by Asness (2012) but updated in Table 1, shows a very distinct relationship: The average of ten-year forward returns decreases as the starting value of CAPE increases, with both worse and best cases getting weaker. However, as noted in Asness (2012), critics will point to the large standard deviation of the realised returns in each decile, highlighting an important caveat: There are occasions where CAPE has been incorrect in forecasting subsequent ten-year real returns. Nonetheless, with such a clear and distinct relationship, a starting CAPE value of 31.21 is still concerning for investors looking at US equity markets.

Table 1: S&P 500® 10-year forward annualised returns from different starting CAPE ratios, Q1 1926 – Q2 2017

Starting CAPE ratio			Real 10-year S&P 500® Ann. Returns			
Average	Low	High	Average	Worst	Best	Std Dev
8.6	5.6	9.6	9.8%	4.2%	17.2%	2.2%
10.3	9.6	11.0	10.6%	3.8%	16.9%	3.4%
11.5	11.0	12.1	10.0%	2.6%	14.7%	3.4%
13.0	12.1	13.9	8.7%	0.7%	14.1%	3.7%
15.0	13.9	16.1	7.8%	-1.6%	15.0%	4.9%
17.0	16.1	17.8	5.4%	-3.8%	14.6%	5.4%
18.7	17.8	19.9	5.0%	-4.0%	13.5%	4.2%
21.0	19.9	22.0	2.7%	-3.3%	8.6%	3.9%
24.1	22.0	26.4	2.5%	-4.0%	7.3%	3.6%
33.2	26.4	44.2	0.9%	-6.1%	5.8%	3.4%

Source: Barclays and Prof. Shiller website[2]

One such reason for this is because of experience: In December 1996 Robert Shiller and John Campbell presented empirical evidence to the Board of Governors of the Federal Reserve (Shiller [1996]), where historically on average when the CAPE ratio for the US market has been high, subsequent 10-year returns have been low or negative, and vice-versa. At that time they expressed concern that prices were becoming high relative to earnings – a warning that was well served given the subsequent bursting of the technology bubble in 2000.

At the height of this bubble, as can be seen from Figure 1, Shiller's CAPE ratio reached its all time high of 44.2. Currently CAPE is just over two-thirds from this peak. As such, there is good reason for the debate on if CAPE is sensibly stating that the US stock market is overpriced: Table 1 shows that historically, at such a

Such an example highlights that CAPE has both its advocates and its critics – we document both perspectives for the main debated points in Table 2. In summary, advocates generally point to the idea of smoothing out earnings over business cycles as intuitive and sensible. Critics on the other hand mainly focus on ways to claim that the observed CAPE ratios are too high and not valid for reasons such as statistical significance and/or changing accounting standards over the years.

Whilst much has already been done on the subject, we attempt to pull this debate together to investigate CAPE and its many perspectives, in other words, its

[3] Table 1 is the compilation of the ten-year forward real returns of the S&P 500® over every possible rolling decade since 1926 for different starting CAPE ratios and is then separated by deciles.

many "colours". Specifically, we analyse if CAPE is robust from three distinct perspectives:

1. Predictability
2. Alternative CAPEs
3. Uses of CAPE

data sample as possible for some of the variables, we interpolate quarterly data points from annual observations. We outline the cases where this is required below and also fully detail our methodology for performing the predictability tests, including statistical significance considerations.

Table 2: Main debated points of the CAPE ratio

	Champions	Critics
Use of earnings to price as a valuation metric	This is an intuitive characterisation of the relationship between earnings and price whereby the assessment is based on how many dollars of earnings do investors receive from every dollar invested in the S&P 500®	Whilst "price" is well defined, there is a question of which "earnings" should be used, reported earnings, operating earnings, etc. Siegel (2016) has spearheaded this specific debate
Use of a ten-year average of earnings (inflation adjusted)	Sensible given one-year trailing earnings are highly volatile and strongly mean-reverting. A ten-year average is a more stable metric	Why ten years and not eight or twelve years?
Out-of-sample efficacy	Has twenty-years of "live" performance since CAPE was first presented	Accounting standards have changed over time, so for example, the nature of earnings in the 1950s are not the same as in 2000s

Predictability

CAPE certainly has its statistical critics which lead to the question of if CAPE is the 'right' measure, irrespective of its application, be it for valuation or asset allocation. We answer this through assessing the return predictability of CAPE at different horizons compared to a host of other valuation based metrics that are often used or cited by either academic works or by market practitioners.

Such a time-series predictability study at the aggregate market level adds to a host of other works on predictability – we cite a few which we draw inspiration from, namely Campbell & Shiller (1998), Campbell & Thompson (2007) and Ang & Bekaert (2007).

Table 3 outlines a comprehensive list of predictor variables tested and complimentary academic references. Our data is based on quarterly observations which for a large part matches the reporting frequency of the valuation metrics under consideration. However, in order to obtain as long a

Alternative CAPE Constructions

Siegel (2016) claims that the current levels of the CAPE ratio are biased upwards due to changes in accounting practices leading to reported earnings being depressed relative to history, and especially more so during economic downturns.

He documents that companies report their earnings in two ways, reported earnings and operating earnings. The former is now reported as per the Generally Accepted Accounting Principles (GAAP), which is set by the Financial Accounting Standards Boards (FASB) founded in 1973 and this is the basis of the reported earnings published by Standard & Poors.

Changes in Reported Earnings

Siegel (2016) claims that GAAP has undergone substantial changes in the last two decades, the most notable being:

1) FASB Statement of Financial Accounting Standards (FAS) No. 115: Assets that were held

for trading or "available for sale" were required to be marked to fair market

2) FAS Nos. 142 and 144 (issued in 2001): Any impairments (e.g. goodwill) to the value of the assets (property, plant, equipment and other intangibles) be marked to market, where companies are required to "write down" asset values regardless of whether the asset was sold – which as expected is especially severe during economic downturns. However, these assets cannot be written back up unless they were sold and recorded as "capital gain" income.

Table 3: Full list of different valuation based measures used in this study

Predictor variable	Academic references
CAPE	Campbell & Shiller (1988)
Reported Earnings / Price (E/P)	Campbell & Shiller (1988)
National Income and Production Account profits / Price (NIPA/P)	Siegel (2016)
Operating Earnings / Price (O/P)	Siegel (2016)
Dividends / Price (D/P)	Fama & French (1988), Campbell & Shiller (1988), Goetzmann & Jorion (1993, 1995), Hodrick (1992), Goyal & Welch (2003, 2004), Campbell & Yogo (2006)
Book value / Price (B/P)	Kothari & Shanken (1997)
Cash Flow / Price (CF/P)	None[4]
Sales / Price (S/P)	None[4]

As such, Siegel (2016) proposed an alternative of National Income and Product Account (NIPA) corporate profits from the Bureau of Economic Analysis (BEA) to be used in the context of correcting the bias in CAPE. Siegel's findings were that if one were to use NIPA profits, rather than reported earnings to construct the CAPE metric, not only was the series lower on average than reported earnings CAPE, but also exhibited higher explanatory power and forecasted significantly higher stock returns.

We therefore look closely at these claims but also compliment this alternative CAPE construction using NIPA profits, with versions using operating earnings, cash flow, sales and book value as other earnings related proxies. This will allow for a full suite of alternative CAPE constructions through which we can analyse the original CAPE construction based on reported earnings per share. More specifically, we apply the same CAPE construction methodology using the host of variables as the "earnings" input to CAPE and then consider the inference on valuation of the S&P 500® versus that of the original definition of CAPE.

Uses of CAPE

Our last perspective is with the market practitioner in mind – whilst dissecting and detailing the nuances of the predictability efficacy and construction of CAPE is no doubt important, the natural extension of how to use the CAPE ratio in practice is just as important.

Interestingly, many investors and commentators feel that it is natural to use the CAPE ratio in the spirit of market timing.[5] However, we challenge why this is the case. CAPE was around these levels back in 1997, *three years before* the technology bubble burst in August 2000. As such, using CAPE to time the market may not be its best use - Philips and Ural (2016) highlight this by confirming that CAPE does not have a steady-state level and nor should we expect it to do so.

As such, we focus on evaluating the use of CAPE in two contexts, asset allocation and systematic relative valuation. The former being an important exercise for investors strategic allocation programmes whilst the latter concerning itself with the benefit and nuances of using the CAPE ratio to rotate between asset classes (e.g. equities and bonds), countries, industry sectors or even individual stocks respectively.

[4] To the best of our knowledge.

[5] https://www.cnbc.com/2017/04/27/robert-shiller-high-valuations-make-stocks-dangerous.html

Data & Time Series Construction

Data

Starting from Shiller's online dataset back to 1871, we merge and compliment this dataset with data from other sources.[6] As a first step, we merge this dataset with the S&P 500® Composite price index level, dividends, earnings, the Consumer Price Index for All Urban Consumer (CPI-U) level and the US 10-year Treasury yield using Bloomberg data from when its first historically available.[7] As such, by also basing the frequency of our study on end-of-quarter data we mitigate a concern with the online dataset: The price series is generally based on the average of the price levels within the month.[8] As such, for our approach, from Q4 1927, prices are based on spot information, i.e. end-of-quarter prices.

We then compliment this data with as much available history as possible on the S&P 500® divisor, operating earnings per share, sales per share, cash flow per share and book value per share directly from Standard and Poor's. Following Siegel (2016) we also obtain NIPA profits from line 45 of Table 1.12 of the National Income and Product Accounts Tables compiled by the Bureau of Economic Analysis (BEA).[9] Lastly, we proxy for the risk-free rate using the USD 3-month Libor rate.

Table 4 documents the sample history that we have for each variable under consideration. It is important to note that for several data series, annual data is only available for the early history of that series – the period of which is also noted in the below table – as such, during this period, we linearly interpolate the data between the annual observations to obtain quarterly frequency data.[10]

Note that for NIPA profits, this needs to be deflated into a NIPA profits per share series using the S&P 500® divisor so as to be comparable with the other data series. As such, we follow the procedure of Siegel (2016) in that the S&P 500® divisor data only goes back to 1964 and thus needs to be extended back to the beginning of the NIPA series in 1929. This is done through applying the average change in the divisor during the 1964 – 2016 period back to 1929, which is 1.23% per year.

Table 4: Sample history available for all series considered

Data series	Sample history available
Reported Earnings / Share	Q1 1871 – Q2 2017
Dividends / Share	Q1 1871 – Q2 2017
Operating Earnings / Share	Q4 1988 – Q2 2017
Sales / Share	Q4 1946 – Q2 2017 (Annual data: 1946 – 1989)
Cash Flow / Share	Q4 1977 – Q2 2017 (Annual data: 1977 – 1989)
Book value / Share	Q4 1977 – Q2 2017 (Annual data: 1977 – 1989)
NIPA profits	Q4 1929 – Q2 2017 (Annual data: 1929 – 1947)
S&P 500® Divisor	Q4 1929 – Q2 2017 (Extrapolated pre-Q1 1947)

A CAPE Correction: Total Return CAPE

As documented in Bunn & Shiller (2014), changes in corporate payout policy can affect the level of the CAPE ratio, i.e. that share repurchases rather than dividends have now become the dominant approach for cash distribution to shareholders in the US – see Figure 2, which *may* have an effect on the growth rate of real earnings and thus also the average of real earnings per share used in the CAPE ratio.

In order to correct for this potential bias in CAPE from changes in corporate payout policy, a Total Return CAPE (henceforth TR CAPE) can be constructed,

[6] http://www.econ.yale.edu/~shiller/data/ie_data.xls

[7] Note that the CPI-U level is ultimately obtained from the US Bureau of Labour Statistics and the 10-year Treasury yield is based on the H.15 release of the US Federal Reserve

[8] For the earliest part of the pricing history available in the online dataset, the price is based on the average of the month's high and low price for the data that is obtained from Cowles (1939). For more intimate details on the dataset, see the comprehensive documentation by Bunn & Shiller (2014).

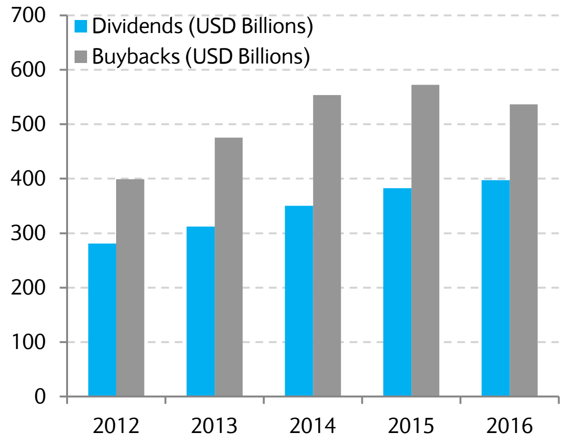
[9] https://www.bea.gov/iTable/index_nipa.cfm

[10] We of course acknowledge the potential bias in the predictability regressions results when using interpolated data. Such a caveat is required in order to obtain as long a sample history as possible for the other variables under consideration.

which includes dividends reinvested into the price index. Such a correction is important for analysis at long-horizons and as such, going forward we only focus on the results of the TR CAPE. For brevity, we defer the outline of the construction of TR CAPE to the Appendix but note an important point here:

We construct our TR CAPE for use in an out-of-sample context, where we ensure we use data that we know was available at that moment in time historically, through lagging our use of real earnings per share (or any of the other earnings proxies for that matter). We do this to add a layer of robustness to our predictability regressions.

Figure 2: Aggregate dividends and buybacks paid by S&P500 companies over the last 5 years



Source: Standard and Poor's website[11]

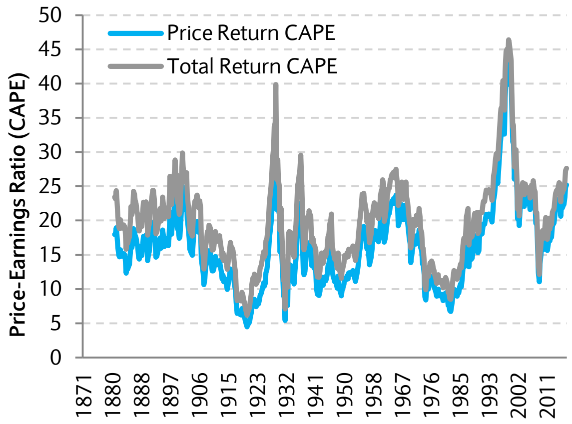
For reference sake, Figure 3 shows both the price return (PR CAPE) and total return CAPE (TR CAPE) ratios. The variation of the two are very similar however on average, the level of PR CAPE is 16.74 versus 20.14 for TR CAPE, or 20.3% higher, which is a similar number reported by Siegel (2016).

NIPA Profits vs. Reported Earnings

Whilst we acknowledge the results of Siegel (2016) for the consideration of NIPA profits as a replacement for reported earnings in CAPE, when looking further into the makeup of the NIPA profits dataset, a few concerns arise.

Firstly, it should be acknowledged that NIPA corporate profits include both publicly listed and private companies. The latter representing a large portion of the overall economy. Thus when converting the corporate profits series to a NIPA per share number based on the S&P 500® divisor, as well as using it in a CAPE construction with the S&P 500® price, two problems arise: One, a tradable price is being used to compare against a non-tradable earnings proxy. Two, potential bias in the sector decomposition of the S&P 500® versus the universe which makes up NIPA profits.

Figure 3: Price return versus total return CAPE, Q2 1881 – Q2 2017



Source: Barclays and Bloomberg

Nuances of NIPA Data: Release and Revisions Schedule

Secondly, we notice a somewhat extensive release and revision schedule for the NIPA data. Whilst this is not a problem for studies on predictability and valuation assessment historically; for out-of-sample use, this potentially poses a problem, or at the very least a significant concern.

For the data released by the BEA, as confirmed by Kate Shoemaker Pinard, a Senior Corporate Profit Analyst at the BEA, there are three separate release and revision horizons:

1) Quarterly:

- First estimate: 1 month after quarter end – First release of Gross Domestic Product (GDP) numbers
- Second estimate: 2 months after quarter end – First release of Corporate Profits for the quarter, first revision of GDP
- Third estimate: 3 months after quarter end – First revision of Corporate Profits, second revision of GDP

[11] https://us.spindices.com/

For any revisions made in the manner above, it can generally only be to the data for the respective quarter of interest, however there are a few corporate profit series for which the previous quarter can also be revised during the second estimate.

2) Annually:

- 1 month after the 2nd quarter end, i.e. end of July, the BEA performs an annual review of their data going back 12 quarters (3 years) and can revise this data accordingly

3) Every 5 years

- The BEA performs a comprehensive review of the entire data history and can revise accordingly. For example, if there is a change in definition for a particular series, at this moment, they will then revise the whole history for this series based on the new definition. The last comprehensive review was in 2013.

S&P Earnings: Release and Revision Schedule

As for the release and revision schedule of reported earnings per share from Standard and Poor's for the S&P 500®, as confirmed by Howard Silverblatt, the Senior Index Analyst for S&P Dow Jones Indices – simply, once earnings numbers are released, they are not revised.

Taking the release of Q2 2016 S&P 500® earnings as an example:

A company can restate their earnings number every day up to 30th September 2016, these numbers are then marked as final and no revisions can then be made after this date, regardless of whether there is a post September 30th revision by the company on its financial statements. These marked final aggregate earnings numbers for the S&P 500® are then released in early October 2016.

Thirdly, in the context of goodwill write-offs, Huefner & Largay (2004) explicitly detail the accounting of FASB Rule Nos. 141 and 142 stating that they required periodic, at least annual, assessments of impairment of goodwill, and write-downs as the impairments are discovered, but also eliminated the regular amortization of goodwill.[12] As such, the effect of Rule 142 will thus work in two offsetting directions on earnings, occurring at different times, and may make relatively little difference to the ten-year average of earnings, which is the basis of earnings used in the CAPE ratio - we explicitly test this in the data.

With all of this in mind and given the results of Siegel (2016), we look to do a detailed compare and contrast of the difference between a NIPA profits constructed CAPE and the original reported earnings CAPE. Based both on the approach by Siegel (2016), where a splicing methodology is used to extend the history of the earnings proxies under consideration and on an approach where only on ***actual reported data*** for the respective earnings proxies that we consider is used.

Empirical Results

Predictability Regressions

We perform multiple horizon univariate predictability regressions of the form:

$$r_{t+k} = \alpha + \beta_k X_t + \epsilon_{t+k,k} \qquad \text{Eq 1}$$

Where $r_{t+k} = \left(\frac{4}{k}\right)[(r_{t+1} + \cdots + r_{t+k})]$ is the annualised k-period inflation adjusted excess return (above the risk-free rate) for the S&P 500® with all returns being continuously compounded, X_t is the valuation metric under consideration as per Table 4 and β_k is the predictive coefficient at horizon k.

As the predictability literature is rich, especially on the robustness of running long-horizon predictability regressions, we acknowledge the following concerns:

1. **Endogenous regressor problem** – whereby price appears on both sides of the equation thereby violating standard OLS assumptions of independence and exogeneity.

2. **Induced autocorrelation in the residuals** – as a result of using overlapping observations, which is a common approach for long-horizon predictability regressions in order to maximise the data that is available.

[12] As a recap, goodwill in accounting arises when a company acquires another entire business. The amount of goodwill is the cost to purchase the business minus the fair market value of the tangible assets, the intangible assets that can be identified and the liabilities obtained in the purchase.

As such, we note two resulting observations:

1. Inflated R^2s – whereby long-horizon R^2s can overstate predictability given the "small-sample" of data we are working with.[13]

2. Biased t-statistics and an over rejection of the null hypothesis – the overlapping observations and time-varying volatility cause OLS t-stats to over reject the null of no predictability.

With the former, as we intend to do a relative comparison of the R^2s across the different valuation metrics, the same bias exists, which makes the relative comparison still applicable. As for latter, such a problem is widely known and understood and as such, we can correct the t-stats for such a bias. Given that this is also an active area of research, we calculate two different corrections and take the respective average of the t-stats. Specifically, we report the following two corrections:

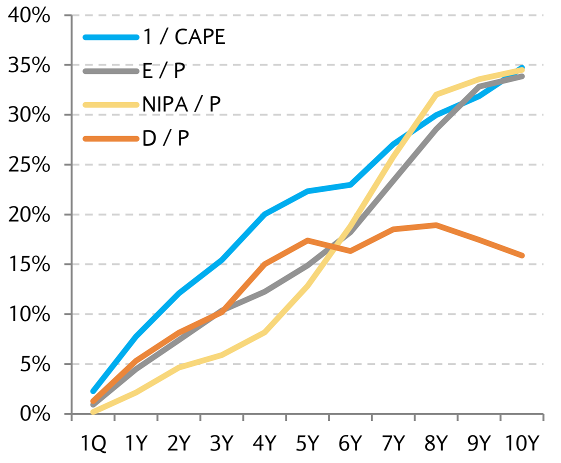
1. Hansen-Hodrick (1980) – HH t-stats
2. Hjalmarsson (2011) – VH t-stats

Lastly, as an additional step for robustness, we set a high hurdle for significance, being at the 1% level with the threshold critical value of 2.58. Such an approach allows for a conservative method for determining true predictability.

Figures 4 to 6 report the R^2s and (averaged) t-statistics for our predictability regressions.[14] For CAPE, E/P, NIPA/P and D/P respectively, we run these over the period from Q3 1930 to Q2 2017. For B/P, CF/P and S/P, as their respective history is shorter, we run these from their respective start dates (as indicated on the charts) to Q2 2017.

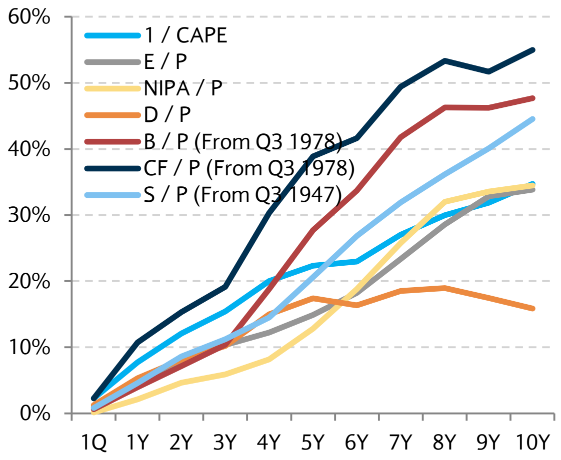
Figures 4 to 6 should be reviewed in tandem. Figure 4 demonstrates the ability of CAPE in forecasting returns better than E/P, NIPA/P and D/P at shorter time horizons. E/P and NIPA/P eventually do catch up and significantly so, as confirmed by their t-stats in Figure 6. However, it is clear that CAPE is able to consistently predict subsequent returns significantly so from a 1Y horizon onwards. The same claim is commonly made for the E/P ratio, however we find that E/P is not as powerful at shorter horizons (from the lower R^2s) and is insignificant at the 1% threshold between a 3Y to 6Y horizon.

Figure 4: Adjusted R^2 versus forecasting horizon for variables with longest available history, Q3 1930 – Q2 2017



Source: Barclays, Bloomberg and BEA

Figure 5: Adjusted R^2 versus forecasting horizon for all variables, Q3 1930 – Q2 2017 (unless from date is noted on legend)



Source: Barclays, Bloomberg, BEA and Standard and Poor's

Interestingly, NIPA yield becomes statistically significant beyond a 5Y horizon and even more statistically significant than CAPE yield at a 10Y horizon, but is as predictive in terms of R^2. Below a 5Y horizon however, NIPA yield is not statistically significant at all, which raises the question of its consistency as a predictor of future equity returns.

Dividend yield on the other hand is a well studied predictor of the equity risk premium. Campbell (1991)

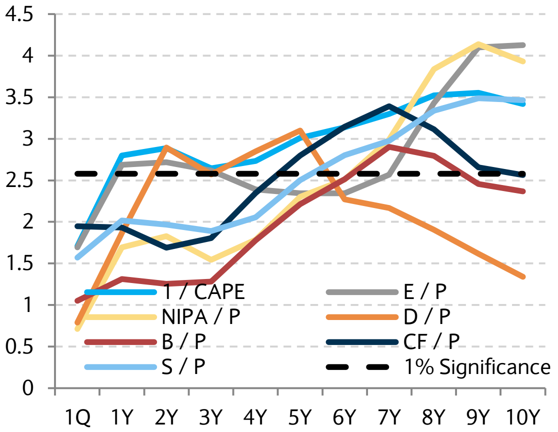
13 Despite the long-history of data for some of the variables, one still cannot rule out a possible small sample bias in the context of unconditional statistical significance

14 Note that for OPS/P, given the short data history available, we do not compare and contrast its predictability results here. For completeness sake, we do show the results in Table A1 in the Appendix, but note that at a 10Y horizon, there are only 73 overlapping observations, or 2 complete non-overlapping observations.

and Cochrane (1992) championed its efficacy, particularly at longer horizons.[15] We find that it appears significant at a 2Y to 5Y horizon, however longer-horizon predictability is not apparent. Whilst dividend yield was once championed as a significant equity risk premia predictor, its efficacy has been diminishing over time, particularly in the US where share buybacks have been an increasing method of distributing cash back to shareholders as previously discussed. Similar conclusions for dividend yield as a predictor were also reached by Ang & Bekaert (2007).

Figure 6 perfectly highlights the small sample bias in long-horizon regressions when comparing the R^2s of B/P, CF/P and S/P with those in Figure 5. Whilst the R^2s may appear higher, especially at the longest horizons, Figure 6 shows that past a 5Y horizon, S/P is the only variable that is consistently significant.

Figure 6: Average t-stats versus forecasting horizon



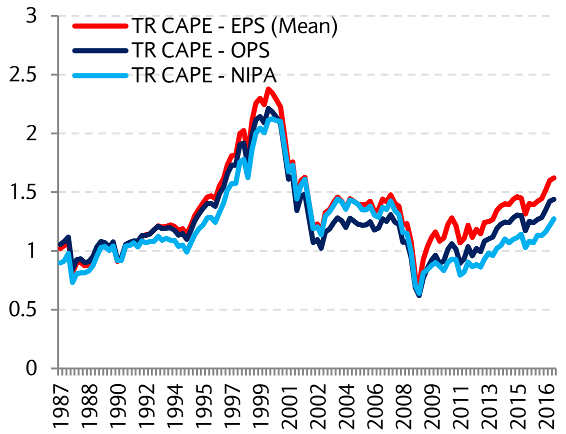
Source: Barclays, Bloomberg, BEA and Standard and Poor's

These regressions have been run in the context of a horserace between different valuation ratios. We find that CAPE, or CAPE yield specifically, is still by far the most consistent predictor of subsequent equity returns at both shorter and longer term horizons. Whilst there may be specific horizons where it is not the most significant or does not have the highest R^2, on balance, given the earlier caveats around statistical concerns, we believe consistency of a predictor should be of more importance than performance of a predictor only at one or two horizons.

CAPE Ratio with Alternative Earnings Series

We start our discussion of alternative CAPEs by first replicating and updating the results of Siegel (2016) – shown in Figure 7. We obtain the same result and find that TR CAPE – EPS (i.e. based on reported earnings per share) is the highest of the three methods above its mean with the lowest projected 10Y equity returns – as confirmed by Table 5.[16,17] The S&P 500® TR Index is now 23% higher than the data used by Siegel (2016) which ended in 2014 – as such, the levels of the TR CAPE ratios are higher and the forecasts of subsequent 10Y annualized returns lower, with TR CAPE-EPS still being the lowest.

Figure 7: Replication of Figure 5 in Siegel (2016) - Total return CAPE ratios relative to their long-term mean, Q1 1987 – Q2 2017



Source: Barclays, Bloomberg, BEA and Standard and Poor's

Table 5: TR CAPE summary statistics, 1881 – 2017

TR CAPE version	EPS	OPS	NIPA
R^2 of forecasting equation	32.83%	33.90%	36.65%
Above mean	61.93%	43.79%	27.18%
10Y real annualised total return forecast	1.73%	2.60%	3.97%

Source: Barclays, Bloomberg and Standard and Poor's

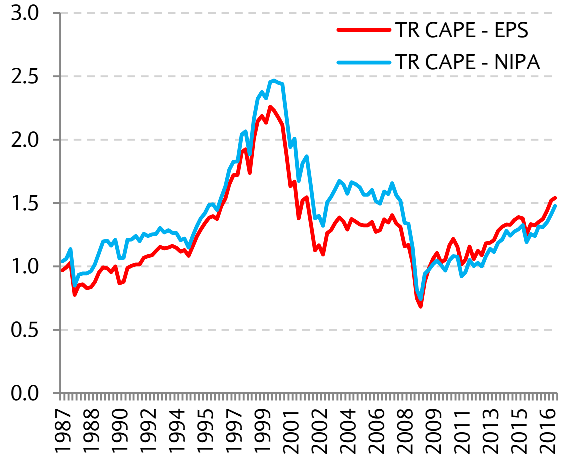
[15] As do many other studies as previously listed.

[16] We also check our R^2s, above mean and 10Y return forecast results at the end of 2014 and confirm that we have very similar results to Siegel (2016) as a validation check.

[17] The 10Y return forecast is obtained through first calibrating Equation 3 on the full history of data to obtain the coefficients (and reported R^2s), which are then applied based on the current level of 1/CAPE to obtain the reported forecast. Note that as per Siegel (2016), the 10Y return forecast is not on returns above the risk-free rate but on absolute returns.

This all being said, an important detail in Siegel (2016) is in the method used to infer the above conclusion. As documented in Table 4, operating earnings per share and NIPA profits have a much shorter data history than earnings per share. As such, the methodology adopted by Siegel (2016) is to splice the earlier history of earnings per share to that of operating earnings or NIPA per share profits when they become respectively available – this is fully detailed in Footnote 16 of his paper. We question such a methodology by attempting to confirm the above conclusions based only on using actual reported observations for the respective variables.[18]

Figure 8: Total return CAPE ratios relative to their long-term mean over 1940 – 2017



Source: Barclays, Bloomberg, BEA and Standard and Poor's

Table 6: TR CAPE summary statistics, 1940 – 2017

TR CAPE version	EPS	NIPA
R^2 of forecasting equation	41.02%	40.09%
Above mean	53.95%	47.66%
10Y real annualised total return forecast	1.92%	3.06%

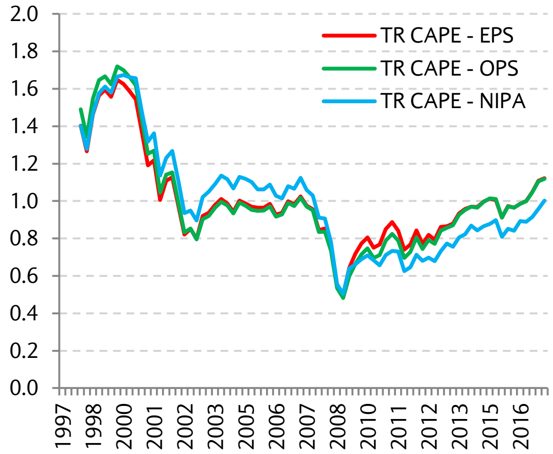
Source: Barclays, Bloomberg, BEA and Standard and Poor's

Figure 8 shows the result of this over the same time period as Figure 7, but where the long-term mean is now based on data from 1940 – 2017, i.e. only on the data period where we have actual reported observations for both EPS and NIPA profits, respectively, and therefore no splicing methodology is required. Visually, the current levels of both TR CAPE – EPS and NIPA look very similar, which is confirmed by Table 6, both TR-CAPEs are around 50% above their means. Interestingly, based on this period of data, the return forecast for NIPA profits drops by ~1%, whereas the TR CAPE – EPS forecast slightly increases to around ~2% versus Table 5.

This exercise has revealed that the same conclusions as per Siegel (2016) cannot be strictly drawn for TR CAPE - NIPA when we only use actual reported NIPA profits data. Whilst TR CAPE – EPS might still be slightly higher, the forecast from TR CAPE – NIPA is significantly lower compared to the Siegel (2016) approach from Table 5. For us, this lack of a result, together with the concerns outlined above whereby NIPA profits are a combination of both public and private corporate profits, as well as the nuanced release and revision schedule, undermine the efficacy of TR CAPE – NIPA, contrary to the conclusions of Siegel (2016).

Operating earnings per share (OPS), on the other hand, potentially make for a good candidate as an alternative proxy for earnings to input into CAPE. Figure 9 shows the evolution of the TR CAPE version for OPS and currently it is exactly the same level as the EPS version. In general it has tracked the original version of CAPE very closely, except for around 2000 and the recovery just after the 2008 financial crisis. However, using only actual OPS data for long-term forecasts, given TR CAPE – OPS can only start in 1998, would be problematic for calibrating a forecasting equation. TR CAPE – EPS thus prevails as still the most sensible approach for forecasting purposes.

Figure 9: Total return CAPE ratios relative to their long-term mean over 1998 – 2017

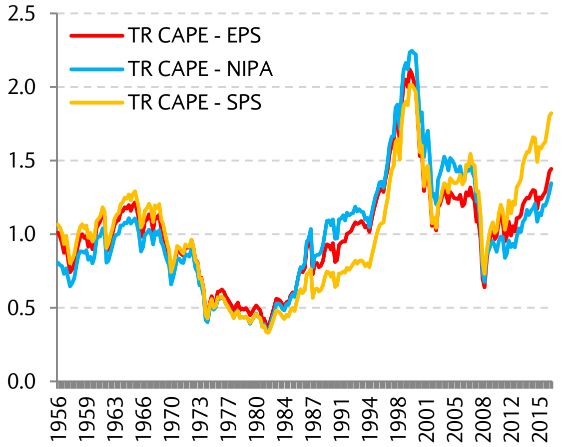


Source: Barclays, Bloomberg, BEA and Standard and Poor's

[18] As noted above, this is inclusive of interpolation of the NIPA profits data before 1947 where only annual observations are available from 1929 to 1947.

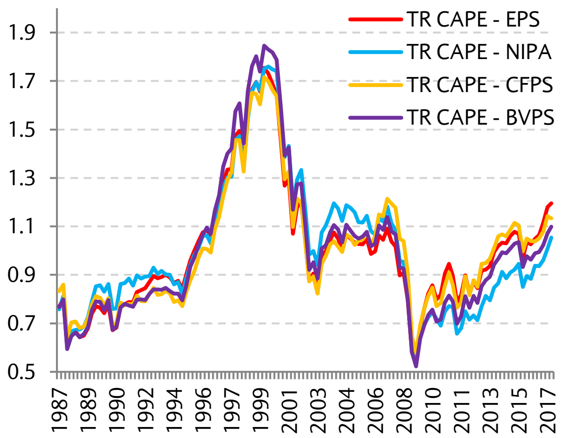
We extend this analysis to also produce TR CAPEs for sales per share (SPS), cash flow per share (CFPS) and book value per share (BVPS). These are shown in Figures 10 and 11 for the periods that we have actual reported data for the respective variables, i.e. no splicing.

Figure 10: Total return CAPE ratios relative to their long-term mean over 1956 – 2017



Source: Barclays, Bloomberg, BEA and Standard and Poor's

Figure 11: Total return CAPE ratios relative to their long-term mean over 1987 – 2017



Source: Barclays, Bloomberg, BEA and Standard and Poor's

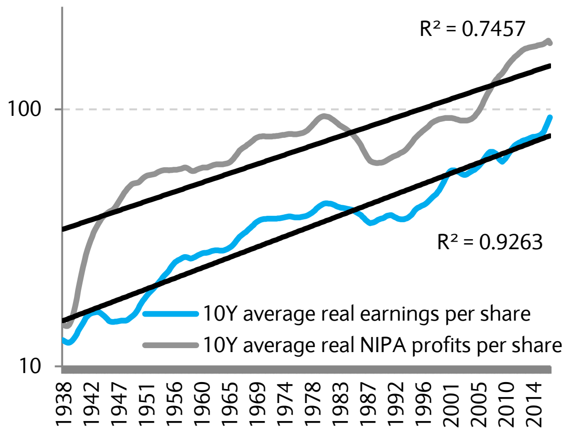
Interestingly TR CAPE – SPS is currently higher than original TR CAPE, whereas in Figure 11, it appears that the TR CAPEs for CFPS and BVPS are only marginally lower than original CAPE. From this two observations are clear:

1. TR CAPE – EPS is not consistently higher than the alternative versions of TR CAPE
2. Whereas TR CAPE – NIPA ***is*** consistently the lowest of all the alternative versions of TR CAPE

Thus, although we acknowledge the arguments of Siegel (2016) for potential bias in reported earnings per share, this does not bear out in the data - a conclusion also reached by Asness (2012) through depicting the 10-year average of real reported earnings against its long-term trend line – Figure 12 recreates and updates this analysis with an addition, that for NIPA profits per share.

We agree with Asness (2012) that currently it does not appear from the data that real EPS is biased downwards (and thus CAPE is biased upwards). Figure 12 shows that over the last few years, the 10Y average of real EPS has actually been around or even above its long term trend, not below, as is the claim by Siegel (2016). This also confirms our earlier intuition in the context of the role of goodwill write-offs as per Huefner & Largay (2004).

Figure 12: Long term trend line for 10Y average of real reported earnings and NIPA profits per share (log scale), 1938 - 2017



Source: Barclays, Bloomberg, BEA and Standard and Poor's

More interestingly, the 10Y average of real NIPA per share is currently and has been since 2010 much higher than its long term trend. If anything, we posit that in fact an upward bias exists in the NIPA profits data currently, which would lead to a downwards bias in its TR CAPE version, as per observation 2 above. As for the reasons for this, we leave this as an open question but firmly conclude that we are left with doubts as to the reliability of a NIPA profits based CAPE, and little doubt on the robustness of the original reported earnings based CAPE ratio.

Uses of CAPE

With the above perspectives in demonstrating the robustness of CAPE in mind, we now naturally consider how to use CAPE in practice.

Market Timing

Whilst it may feel intuitive to do so, CAPE is not a market timing tool. Historically, it can be seen that equity markets have both risen and fallen for extended and non-symmetric periods of time and, as such, CAPE does not have a steady-state level. Unless expected returns are supposed to mean-revert to some level, there is no reason to expect CAPE to have a steady-state. Philips and Ural (2016) note the continuing discussion around the equity premium puzzle and that expected returns seem to be decreasing over time, which is not unreasonable given the decline in fees and expenses in accessing the equity risk premium.

Thus, whether CAPE is high or low relative to a defined average is immaterial. A more interesting and valid exercise is to look to estimating the prospective returns of equities in an asset allocation context or relative valuation contexts.

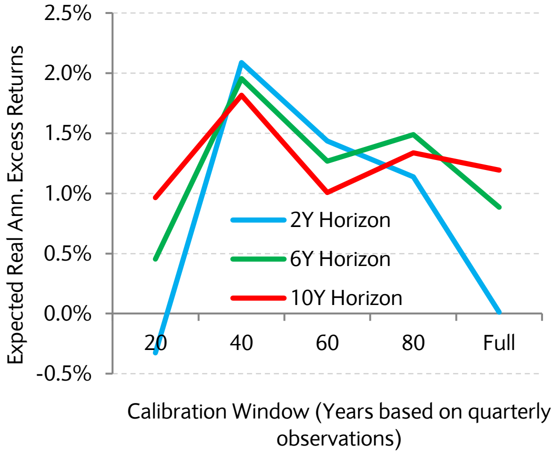
Asset Allocation

The example for asset allocation is a straightforward one where the current value of CAPE is used to forecast the equity risk premium. We do so again using Equation 3 where this time, we calibrate our model based on the latest data going back X years (using quarterly observations) as per Figure 13. Such an approach extends the manner of forecasting to also address concerns around how much data should be used for calibration.

The usual approach is to typically use all the data that is available. However, such an approach may not capture recent changes in the underlying relationships, for example, the cost of investing in equities now versus 50 years ago is significantly different, which may have implications for expected returns. As such, using the full history may bias it downwards. The counter-argument of using only recent data may neglect the information contained in the very long-term relationships. Thus, the addition of a calibration dimension provides investors with a more balanced view and a range of expected returns by calibration period.

Figure 13 shows this application for our study: The expected range of the ***real excess return*** over a 10-year horizon from the end of June 2017 is 1.00-1.75% per annum.[19] The variability of shorter horizon forecasts can also be clearly seen by the possible ranges for 2-year and 6-year horizons.

Figure 13: Expected real excess returns of the S&P500 as of June 2017



Source: Barclays and Bloomberg

Relative Valuation

Whilst the outright forecast of equity returns has been the most common application of CAPE, doing so in isolation of the level of interest rates now seems uncomfortable, given the very low level of long-term rates, as can be seen from Figure 1. Thus, we believe relative valuations between stocks and bonds should now be particularly relevant.

Indeed, for investors the natural alternative to investing in stocks is to invest in long-term bonds. We conjecture that perhaps the attractiveness of stocks is currently enhanced by the very low yields available on long-term bonds. In Shiller (2015) it is first documented that ***excess real returns of stocks over bonds*** are influenced by CAPE and also real long-term interest rates - over a 10-year horizon this relationship has an R^2 of 0.41.[20] Thus a strong signal to replace US stocks with US long-term bonds would arise when both CAPE and real long-term interest rates are high – this is not currently the case.

[19] We note that Research Affiliates are even more pessimistic and have this forecast as of the end of July 2017 at 0.5% per annum but note that they use a multivariate forecasting approach.

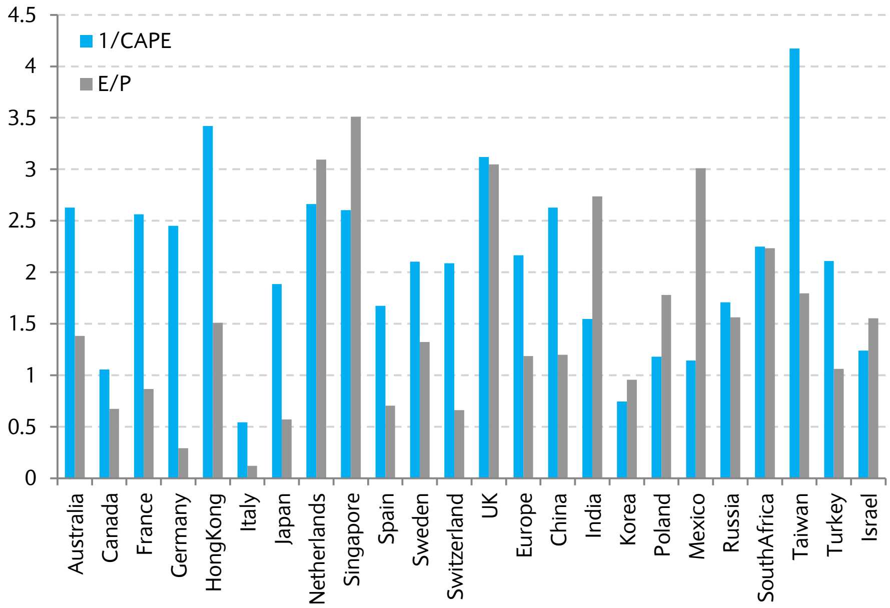
[20] This was for over the period from 1881 to 2014. For full details, see Shiller (2015), endnote chapter 11, number 22, page 315.

With CAPE at 31.21 and estimated real (T-rates)long-term interest rates around 0.55%, a predicted annualised excess return for U.S. stocks over bonds between June 2017 and June 2027 is still a positive ~1% per year. It is, perhaps, the current driver of continuing positive equity market returns and a view point which should start to take centre stage. We leave this as an open question for future research.

significant, 1/CAPE performs better than E/P in 86% of the cases, even at a one-year horizon.

Given such a result, investors natural intuition is to therefore compare CAPEs across countries – a quick search on Google would show numerous country relative valuation exercises based wholly or in part using the respective CAPE ratios. However, whilst

Figure 14: HH-1980 t-stats for 1/CAPE and E/P across countries, various start dates (Table A2) – Q2 2017



Source: Barclays, Bloomberg and MSCI

A country perspective

It is of course possible to extend the above analysis to other international equity markets – as can be seen from Figure 14 which highlights the efficacy of 1/CAPE versus E/P across 24 international equity markets respectively. The figure shows the Hansen-Hodrick (1980) corrected t-statistics for a one-year horizon predictability regression (based on real returns) using monthly data from when it is available (see Table A2) to Q2 2017 compiled from MSCI and Bloomberg.[21,22] Ignoring if the regression is statistically significant, in 71% of cases, the t-stat for 1/CAPE is higher than that for E/P. When conditioning on if the regression is statistically

such an exercise and the adoption of this approach seems intuitive at first, there are notable concerns. The main one being that national equity markets whose CAPEs you would wish to compare can have very different sectoral compositions, e.g. as of the end of July 2017, the Information Technology sector represented 22.8% in the S&P500 versus 1.0% of the FTSE100's market capitalisation.

A second being the inconsistency in sectoral relative valuation between countries, driven by the very nature of the companies within a respective sector being very different across countries. A third being that accounting rules for companies to report earnings can be different across countries. A fourth being FX considerations – should country CAPEs be based on local currency, or based on a USD denominated CAPE – this is particularly relevant if one wishes to build a systematic CAPE based country rotation portfolio.

With these challenges being said, comparing CAPEs across countries can still be informative within an asset allocation exercise – as demonstrated by Philips

[21] More specifically, we obtain country-level earnings, price/total return index levels and country-level CPI data from the data sources and construct both 1/CAPE and E/P in the same manner as previously outlined, based on a three-month lag of the CPI level where it is needed, and a six-month lag to earnings.

[22] Note that we only consider HH corrected t-statistics for simplicity sake.

& Ural (2016). However, we also acknowledge the findings of Asness et al. (2013) of a statistically significant value premia across countries based on the book-to-market ratio and, as such, we should not definitely rule out the possibility of a systematic way to rotate across countries based on CAPE as the underlying driver.

A sector perspective

Whilst relative country valuation is the most typical focus by investors in the use of the CAPE ratio, Bunn & Shiller (2012) first demonstrated the significance of the CAPE ratio at a sector level and its applicability for relative sectoral valuation. More specifically, by applying CAPE to sectors, the same significant negative relationship between CAPE and subsequent returns was found as with regional equity markets. Given that within a respective regional market one does not suffer from the above noted challenges when assessing sectors, a relative valuation of the sectors based on CAPE can be used to select undervalued sectors.

Figure 15: CAPE Sector Strategy – Portfolio Construction Steps

1. **Obtain Sector Data:**
Calculate sector index prices/earnings for 10 sectors to obtain CAPE and Relative CAPE ratios

2. **Sector Selection:**
Select 5 most undervalued sectors based on their Relative CAPE indicators

3. **Momentum Filter:**
Remove sector with the lowest 12-month momentum

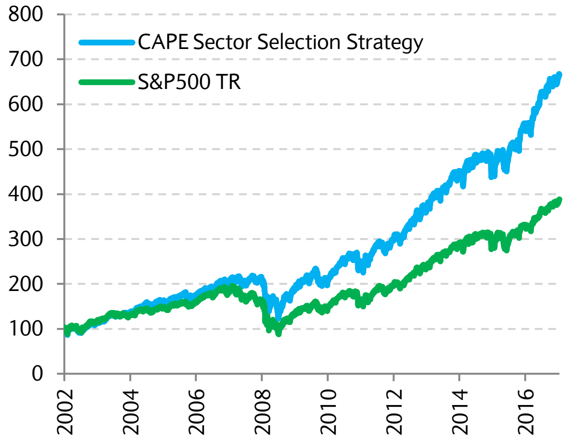
4. **Final Portfolio**
Equally weight remaining 4 sectors and rebalance monthly

Source: Barclays

Ural et al. (2012) comprehensively document the use of CAPE for sector selection where they present a modification to the CAPE ratio in order to allow for comparability across sectors – referred to as the Relative CAPE indicator. This is a standardization of the CAPE ratio of a sector relative to its own long-term history. More concretely, it is defined as the ratio of the current CAPE ratio for the respective sector to the 20-year average of its CAPE ratio. It is this Relative CAPE ratio that is then used in a relative valuation sense across sectors to identify those that are undervalued (relative to their peers).

Figure 15 outlines the steps for such a strategy inclusive of a momentum filter to eliminate a sector which has the potential to be a "value trap" sector.

Figure 16: Performance of CAPE Sector Strategy (September 2002 – August 2017)



Source: Barclays and Bloomberg

Table 7: Performance statistics of CAPE sector strategy (September 2002 – August 2017)

	CAPE Sector Selection Strategy	S&P500 TR
Ann. Avg. Return (%)	14.23%	10.78%
Ann. Volatility (%)	17.98%	18.73%
Sharpe Ratio	0.70	0.49
Maximum Drawdown	43.54%	55.25%
Relative Performance Statistics (to SPTR)		
Ann. Outperformance (%)	3.45%	
Tracking Error (%)	5.28%	
Information Ratio	0.65	
Correlation with SPTR	0.96	
CAPM Beta	0.92	

Source: Barclays and Bloomberg

We highlight the performance of this strategy applied to US sectors in Figure 16 and Table 7. It is clear that a relative valuation approach at a sector level based on CAPE, with the elimination of a sector which has the potential to be a "value-trap", led to a significant outperformance of 3.45% per annum on average versus the S&P500 TR index.[23] Cenk et al. (2012)

[23] In unreported results we also note a significant spread between the 5 most undervalued sectors versus the 5 most overvalued sectors as per step 2 of Figure 15, i.e. assessing their Relative CAPE ratios, rebalanced on a monthly basis. The average spread being 4.35% per annum. This should

show this result to be robust across time periods and also highlight the presence of a significant Fama-French alpha.[24] Such evidence provides support for the use of CAPE in sector relative valuation systematically.

A single stock perspective

Similarly to that for sectors, there is merit in a CAPE based approach for rotating between single stocks, for a complimentary approach to that of Fama-French (1993) to extract a cross-sectional value risk premium. Implemented in a similar spirit to the sector strategy, Figure 17 highlights the mechanics.

Figure 17: CAPE Single Stock Strategy – Portfolio Construction Steps

1. Base Universe:
All stocks from the NYSE and NASDAQ indices excluding REITS, ADRs and closed-end funds

2. Apply First Stock Filters: Remove stocks
- Liquidity: Less than $50 million 3m ADV
- Market Cap: Less than $5 billion

3. Apply Second Stock Filter: "Old Standby™"
Remove stocks which do not have a minimum price history of a few decades

4. Stock Selection:
Select top 100 stocks by CAPE yield – implement on sector neutral basis

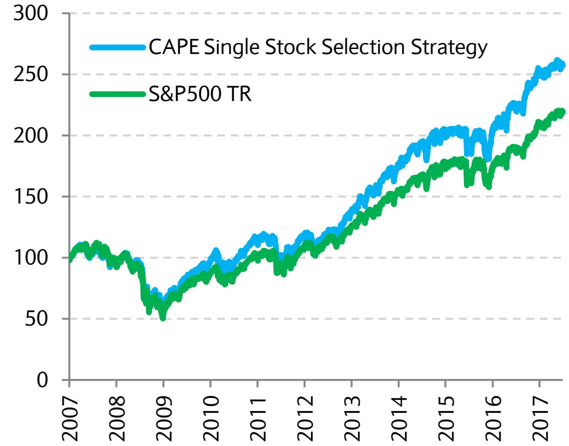
5. Momentum Filter:
Remove 20 of stocks with the lowest 12m – 1m price momentum

6. Final Portfolio:
Equally weight 80 stocks and rebalance quarterly

Source: Barclays

The performance of the strategy is shown in Figure 18 and Table 8. The outperformance of the CAPE single stock strategy appears consistent and on average is 1.58% above that of the S&P500 TR index. With similar risk properties to that of the benchmark index, this strategy can therefore serve as a way to take equity risk with the added chance of outperformance through the relative valuation of single stocks.

Figure 18: Performance of CAPE single stock (March 2007 – August 2017)



Source: Barclays and Bloomberg

Table 8: Performance statistics of CAPE single stock strategy (September 2002 – August 2017)

	CAPE Single Stock Selection Strategy	S&P500 TR
Ann. Avg. Return (%)	9.33%	7.75%
Ann. Volatility (%)	15.56%	14.99%
Sharpe Ratio	0.60	0.52
Maximum Drawdown	51.02%	55.25%
Relative Performance Statistics (to SPTR)		
Ann. Outperformance (%)	1.58%	
Tracking Error (%)	3.46%	
Information Ratio	0.46	
Correlation with SPTR	0.98	
CAPM Beta	0.95	

Source: Barclays and Bloomberg

Such a result provides further evidence on the ability to use CAPE at even a single stock level. As an interesting extension, motivated by Asness et al. (2015) who find that there is distinct predictability among sectors which is separate from that of individual stocks – we find a low correlation of 18% between the excess returns of the CAPE sector strategy and CAPE single stock strategy.[25] This would affirm the findings of Asness et al. (2015), but also raise the question of if there is a distinct and unique (cross-sectional) value risk premia at both the sector and single stock level – we leave this as an open question for future work.

only further the strength of the conclusion in the applicability of CAPE (or Relative CAPE here) for sector relative valuation.

[24] In unreported results, we also find this to be robust across regions over the long-run.

[25] This is based on the correlation of monthly excess returns of the strategy above its unconditional beta times the returns of the S&P 500® TR index over the sample period from January 2009 to April 2017.

Conclusion

We investigate the "colours" of CAPE from several different angles to test the robustness of the measure first developed in the 1980s by Campbell and Shiller (1988) for stock market valuation. We do this specifically in the context of the current debate on the high CAPE ratio for the US stock market in forecasting lower stock market returns.

Firstly, we investigate CAPE versus its peers in a multiple-horizon predictability regression setting. We find that CAPE consistently displays economic and statistical significance from a one-year through to longer-term horizons, far more consistently than any of its peers.

Secondly, we explore constructions of CAPE based on alternative proxies for earnings. Whilst CAPE based on NIPA profits proposed by Siegel (2016) suggests that Shiller's CAPE is overvaluing the market, this is not consistently the picture when you only use *actual reported data* for the respective earnings proxies and valuation metrics tested.

Lastly, we assess how to practically use CAPE in two different settings, asset allocation and relative valuation, both having unique applications and outcomes which would appeal to different types of investors.

Appendix

Construction of Total Return Series

More concretely, we specifically follow the procedure adopted by Bunn & Shiller (2014): we construct the total return time-series based on end-of-quarter calculations, where these indices represent the value of the portfolio when dividends are reinvested into the index as of the end of each quarter. Starting at a total return price index level of $1 at Q2 1871, our total return index thus evolves according to:

$$PTR_{t+1} = PTR_t \times \frac{P_{t+1}+D_{t+1}}{P_t} \qquad \text{Eq. A1}$$

Where PTR_t and P_{t+1} are the total return price and price index levels at the end of quarters t and t + 1 respectively and D_{t+1} denotes the dividend series at the end of quarter t + 1, which is the payment which accrues during the quarter t + 1.

Inflation Adjustment

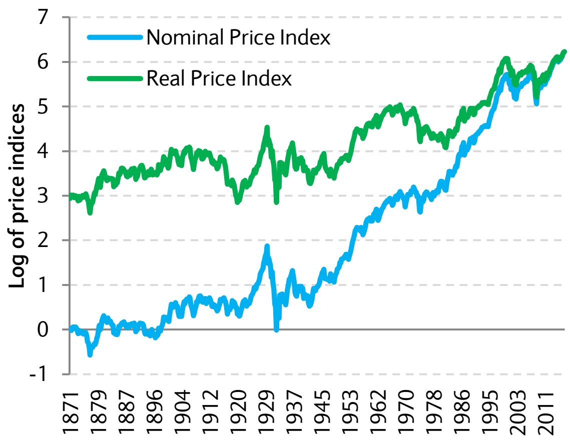
Next, in order to inflation-adjust our series, we do so based on a three month lag to ensure that we use data that we know was available at that moment in time historically, to prevent any forward looking bias when running the predictability analysis. For example, the total return price index level in Q1 1980 is adjusted for inflation based on the CPI-U level as of Q4 1979 where for our analysis the common price ("real") level refers to Q2 (June) 2017. For illustration, Figure A1 shows the nominal and real total return price indices on a logarithmic scale.[26]

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 information 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:

$$E^{scaled} = E^{original} \cdot \frac{P^{TR}}{P^{PR}} \qquad \text{Eq. A2}$$

Figure A1: Nominal and real total return price series, Q2 1871 – Q2 2017



Source: Barclays and Bloomberg

With the analysis on return predictability in mind, we construct our final TR CAPE in a manner where we would be able to use this TR CAPE in an out-of-sample context. Therefore, for our TR CAPE we again ensure that we use data that we know was available at that moment in time historically - by lagging our use of real earnings per share (or any of the other earnings proxies for that matter) contained in the 10-year average window by 6 months.

Note also that the average is based on 10 observations of earnings per share from 6-months prior going back 10 years. For example, the TR CAPE value as of Q2 1995 is calculated based on the real total return price index as at Q2 1995 (given we know the spot price) divided by the average of earnings per share as at Q4 1994, Q4 1993, Q4 1992 to Q4 1984.

[26] This is of course necessary given the length of the sample, whereby small compounding effects over a long period add up to distort the levels. A logarithmic scale therefore more fairly depicts the economic value over long-time periods.

Table A1: Full results of the predictability regressions

Predictor Variable	Forecast Horizon 1Q	1Y	2Y	3Y	4Y	5Y	6Y	7Y	8Y	9Y	10Y	Time Period
1 / CAPE												
Beta	3.02	2.89	2.50	2.18	2.05	1.85	1.61	1.56	1.54	1.50	1.50	Q2 1926 -
t-stat (HH)	1.71	3.26	3.20	3.00	3.13	3.51	3.77	4.03	4.50	4.74	4.77	Q2 2017
t-stat (VH)	1.71	2.34	2.58	2.29	2.34	2.51	2.51	2.57	2.55	2.36	2.07	
Avg. t-stat	1.71	2.80	2.89	2.64	2.73	3.01	3.14	3.30	3.52	3.55	3.42	
R^2	2.28%	7.76%	12.08%	15.44%	20.01%	22.34%	22.97%	27.04%	29.96%	31.85%	34.71%	
No. Obs.	364	361	357	353	349	345	341	337	333	329	325	
E / P												
Beta	1.32	1.51	1.34	1.22	1.09	1.03	0.98	0.99	1.04	1.06	1.04	Q2 1926 –
t-stat (HH)	1.69	3.12	3.15	3.12	2.97	2.94	2.93	3.30	4.55	5.63	5.84	Q2 2017
t-stat (VH)	1.69	2.25	2.28	2.12	1.81	1.75	1.77	1.84	2.31	2.57	2.41	
Avg. t-stat	1.69	2.69	2.72	2.62	2.39	2.35	2.35	2.57	3.43	4.10	4.12	
R^2	0.92%	4.47%	7.41%	10.37%	12.25%	14.89%	18.23%	23.38%	28.56%	32.82%	33.85%	
No. Obs.	364	361	357	353	349	345	341	337	333	329	325	
NIPA / P												
Beta	0.19	0.34	0.32	0.28	0.28	0.31	0.33	0.36	0.37	0.36	0.35	Q3 1930 –
t-stat (HH)	0.71	1.90	2.05	1.78	2.17	2.78	3.10	3.79	4.98	5.43	5.20	Q2 2017
t-stat (VH)	0.71	1.49	1.60	1.30	1.40	1.83	1.92	2.19	2.70	2.84	2.66	
Avg. t-stat	0.71	1.70	1.83	1.54	1.79	2.30	2.51	2.99	3.84	4.14	3.93	
R^2	0.17%	2.14%	4.63%	5.89%	8.16%	12.82%	18.82%	25.78%	32.03%	33.57%	34.48%	
No. Obs.	344	341	337	333	329	325	321	317	313	309	305	
OPS / P												
Beta	0.13	0.14	0.19	0.19	0.16	0.15	0.14	0.13	0.16	0.19	0.20	Q4 1988 –
t-stat (HH)	0.90	1.12	2.02	2.07	1.96	2.27	2.90	3.10	7.93	8.78	13.60	Q2 2017
t-stat (VH)	0.90	0.86	1.45	1.38	1.25	1.18	1.26	1.21	2.00	1.97	3.06	
Avg. t-stat	0.90	0.99	1.74	1.73	1.61	1.72	2.08	2.15	4.96	5.37	8.33	
R^2	0.93%	3.28%	11.66%	16.42%	15.71%	17.13%	19.97%	23.61%	38.86%	58.69%	76.55%	
No. Obs.	112	109	105	101	97	93	89	85	81	77	73	
D / P												
Beta	0.58	2.44	2.09	1.81	1.81	1.68	1.40	1.34	1.27	1.15	1.06	Q2 1926 –
t-stat (HH)	0.79	2.27	3.33	3.10	3.55	3.80	2.95	2.77	2.55	2.17	1.87	Q2 2017
t-stat (VH)	0.79	1.47	2.46	2.05	2.15	2.39	1.59	1.56	1.27	1.06	0.82	
Avg. t-stat	0.79	1.87	2.89	2.57	2.85	3.10	2.27	2.17	1.91	1.62	1.34	
R^2	1.27%	5.30%	8.14%	10.18%	15.00%	17.39%	16.34%	18.52%	18.94%	17.45%	15.87%	
No. Obs.	364	361	357	353	349	345	341	337	333	329	325	
B / P												
Beta	0.03	0.18	0.17	0.16	0.19	0.20	0.18	0.18	0.18	0.16	0.16	Q3 1978 –
t-stat (HH)	1.05	1.44	1.37	1.46	2.09	2.69	3.05	3.46	3.39	3.14	3.06	Q2 2017
t-stat (VH)	1.05	1.19	1.13	1.11	1.47	1.74	1.98	2.35	2.20	1.77	1.67	
Avg. t-stat	1.05	1.31	1.25	1.28	1.78	2.21	2.51	2.90	2.80	2.46	2.37	
R^2	0.62%	3.98%	7.15%	10.39%	18.83%	27.73%	33.70%	41.78%	46.26%	46.21%	47.68%	
No. Obs.	155	152	148	144	140	136	132	128	124	120	116	
CF / P												
Beta	0.25	1.18	0.99	0.90	0.97	0.96	0.83	0.81	0.78	0.72	0.72	Q3 1978 –
t-stat (HH)	1.95	2.09	1.86	2.04	2.73	3.36	3.84	4.12	3.89	3.45	3.36	Q2 2017
t-stat (VH)	1.95	1.78	1.52	1.58	1.97	2.23	2.45	2.66	2.33	1.86	1.77	

Avg. t-stat	1.95	1.93	1.69	1.81	2.35	2.80	3.15	3.39	3.11	2.66	2.56	
R^2	2.29%	10.72%	15.33%	19.16%	30.32%	38.87%	41.64%	49.42%	53.35%	51.69%	54.98%	
No. Obs.	155	152	148	144	140	136	132	128	124	120	116	
S / P												
Beta	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	Q3 1947 –
t-stat (HH)	1.57	2.19	2.15	2.09	2.32	2.88	3.24	3.52	4.04	4.39	4.45	Q2 2017
t-stat (VH)	1.57	1.84	1.78	1.69	1.79	2.12	2.37	2.43	2.63	2.59	2.48	
Avg. t-stat	1.57	2.02	1.97	1.89	2.05	2.50	2.80	2.98	3.34	3.49	3.46	
R^2	0.82%	4.60%	8.61%	11.22%	14.49%	20.61%	26.85%	31.92%	36.16%	40.10%	44.52%	
No. Obs.	280	277	273	269	265	261	257	253	249	245	241	

Source: Barclays, Bloomberg, BEA and Standard and Poor's

Table A2: HH-1980 t-statistics and start dates for the country-level one-year forward predictability regressions

Country	1/CAPE	E/P	Start Date of CAPE data
Australia	2.62	1.38	Sep-1982
Canada	1.05	0.67	Sep-1982
France	2.56	0.86	Nov-1999
Germany	2.45	0.29	Sep-1982
Hong Kong	3.41	1.50	Sep-1982
Italy	0.54	0.11	Oct-1993
Japan	1.88	0.57	Sep-1982
Netherlands	2.66	3.09	Sep-1982
Singapore	2.60	3.51	Sep-1982
Spain	1.67	0.70	Jul-1989
Sweden	2.10	1.32	Sep-1982
Switzerland	2.08	0.66	Sep-1982
UK	3.12	3.04	Sep-1982
Europe	2.16	1.18	Sep-1982
China	2.62	1.20	Apr-2005
India	1.54	2.73	Feb-2004
Korea	0.74	0.95	Mar-2005
Poland	1.18	1.77	Nov-2004
Mexico	1.14	3.01	Jul-2001
Russia	1.70	1.56	May-2006
South Africa	2.24	2.23	Feb-2005
Taiwan	4.17	1.79	Jan-2005
Turkey	2.11	1.06	Jul-2001
Israel	1.24	1.55	Mar-2005

Source: Barclays, Bloomberg and MSCI

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