# PREDICTING STOCK MARKET RETURNS USING THE SHILLER CAPE

*Das Ganze sehen, die Chancen nutzen.*

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# 1

## Literature on CAPE

Over the past 100 years, US stocks realised real capital gains of 7% per annum. No other asset class — neither bonds, cash, gold nor real estate — provided comparable return potential[1]. Nevertheless, stock markets are subject to very strong fluctuations and the achievable returns depend largely on the time of investment. As such, the question for investors is how they can most accurately forecast long-term stock market developments.

In the case of individual stocks, the fundamental analysis of a company can provide information about potential future returns. Based on the well-established value effect, undervalued stocks realise much greater capital growth than overvalued stocks[2]. However, can this finding be applied to equity markets as a whole?

The Harvard and Yale professors Campbell and Shiller [1988] were the first to examine this question for the US market. For this purpose, they calculated a price-to-earnings ratio (PE) for the S&P 500 by dividing the value of the index by the aggregate profits of all companies in the index. They found that periods of high market valuation were often followed by years with low returns[3].

However, the classic PE has two major disadvantages. Firstly, corporate earnings are extremely volatile and, in practice, almost impossible to predict. For example, S&P 500 earnings fluctuated between 7 and 77 points from 2009 to 2010. Thus, the prevailing level of returns is not necessarily representative of their future development. Furthermore, PEs seem to be particularly unattractive in years of crisis, when low or negative corporate earnings provide lucrative buying opportunities. At such times, the PE does not take into account the potential for earnings growth after the crisis.

Already in 1934, Graham & Dodd suspected that cyclical fluctuations in earnings could adversely affect the validity of PE. As a result, they recommended using an average of earnings for the last 7 to 10 years to calculate the PE. Following this advice, Campbell and Shiller [1998] developed a cyclically adjusted price-to-earnings ratio (CAPE), which puts the current market price in relation to the average inflation-adjusted profits of the previous 10 years. The purpose of the 10-year observation period is to ensure that the profits are averaged over more than one earnings cycle. The adjustment for inflation ensures the comparability of profits even at times of high inflation. As such, the CAPE measures whether the value of an equity market is high or low compared to its profit level adjusted for an economic cycle — to which it will very likely return.

From 1881 to 2015, the CAPE for the S&P 500 was frequently between 10 and 22, often returning to its historical average of 16.6 (Figure 1). According to Campbell and Shiller [1998], this mean reversion takes place not because of changes in earnings but in prices, thus enabling more reliable long-term return forecasts than the classic PE.

## Cyclically adjusted price-to-earnings ratio (CAPE) in the S&P 500 since 1881
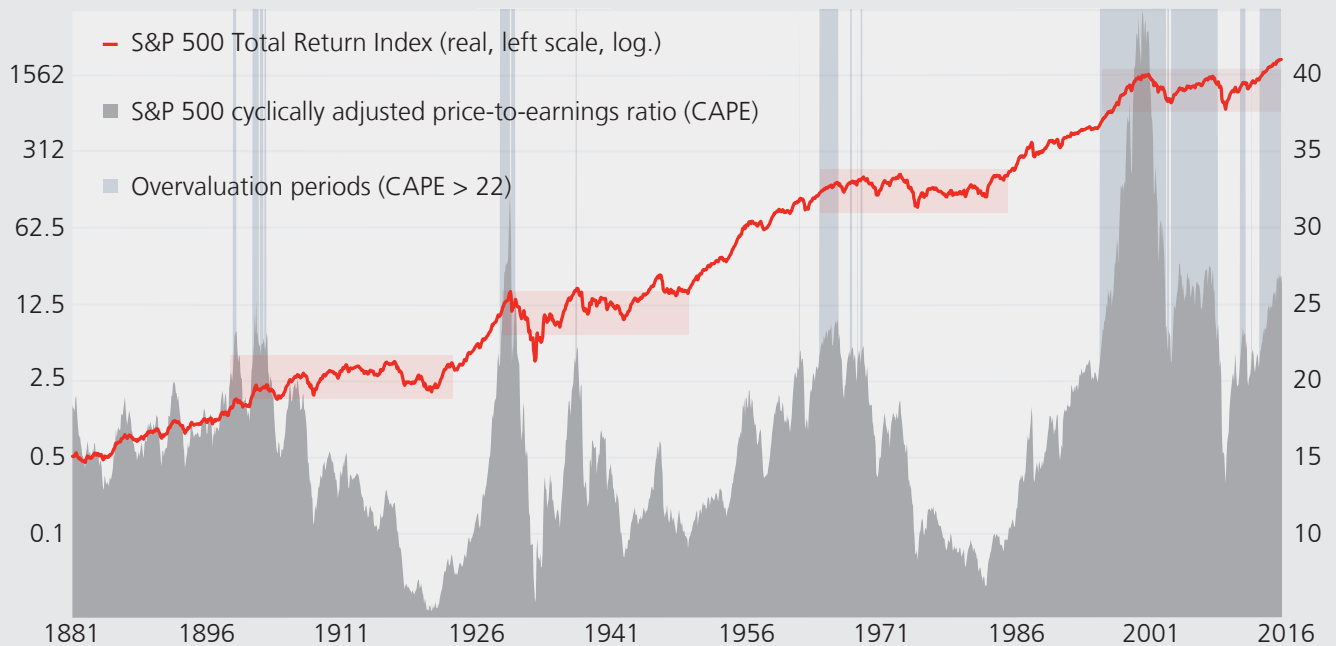


Figure 1: This chart shows the relationship between CAPE and the S&P 500 Total Return Index in USD from 01/1881 to 05/2015. Periods with CAPE-levels greater than 22 are shaded blue, the following stagnation periods are shaded red. Source: Shiller [2015] and own calculations.

Since 1881, the CAPE of the S&P 500 has significantly exceeded this range only four times: in 1901, 1928, 1966 and 1995. For each of these years, plausible reasons were given for why long-standing methods of evaluation should no longer apply, such as the introduction of mass production, the telephone, the departure from the gold standard, the computer age or globalisation[4]. In retrospect, these arguments proved unsound: the S&P 500 marked record highs in each of these years. Investors who invested in these overvaluations generally experienced real losses over periods of 10-20 years.

While high CAPE indicated low returns, attractive CAPE and pessimistic market sentiment led to above-average returns in the long-term. The S&P 500 CAPE has only dropped below the value of 8 three times: in 1917, 1932 and 1980. Each of these years marked historic lows in the S&P 500 — and each time, high real returns of on average 10.5% p.a. followed over the subsequent 15 years[5].

The relationship between CAPE and subsequent long-term returns is not only visible in the S&P 500. Research by Bunn and Shiller [2014], Keimling [2005] and Klement [2012] suggests that the relationship also exists on a sector level, in other international equity markets and in the emerging markets.

# 2

# Criticism of the CAPE approach

Criticism of CAPE has increased in recent times as the S&P 500's CAPE has only fallen below its long-term average of 16.6 in 9 out of 240 months over the past 20 years. Also, the average CAPE of 27.0 since 1995 is around 60% above its long-term average and even at the market's bottom in March 2003, it never fell below 20. It is particularly relevant to ask the question whether altered payout ratios, new accounting standards or other structural changes limit the comparability of current and historical CAPEs. These points of criticism will be discussed in the following section.

## 2.1. CAPE criticism I: payout ratios

In the period 1881-1950, S&P 500 companies distributed 65.6% of their earnings in the form of dividends. Since 1990, it has been only 39.4%. The declining payout ratio gives companies greater scope for investments and share buybacks, which could increase EPS growth. Indeed, corporate profits have grown by 2.7% annually since 1990, much more than the 1.0% from 1881 to 1950 (Figure 2).

This is not without consequences for the comparability of CAPE: CAPE evaluates an equity market on the basis of its average earnings during the previous 10 years. The stronger the permanent earnings growth, the further the current level of earnings moves away from the average, which would lead to higher fair CAPE levels. As such, the higher CAPE that we have witnessed since 1990 could be partially explained by a modified dividend policy.

Therefore, Shiller and Bunn [2014] propose an adjusted CAPE to take into account the modified payout ratios. The authors calculate CAPE on the basis of (theoretical) total return EPS, which presumes a payout ratio of 0% — that is total share buybacks. Whether this adjustment does indeed strengthen the position of CAPE in the S&P 500 remains to be seen. Furthermore, the question remains as to whether the adjustment increases the comparability of CAPE among countries with different payout ratios.

### Falling payout ratios and rising EPS growth in the S&P 500

| Period | Payout ratio | Real EPS growth | Average CAPE |
|---|---|---|---|
| 1881-2015 | 57.2% | 1.7% | 16.6 |
| 1881-1950 | 65.6% | 1.0% | 14.4 |
| 1950-2015 | 50.0% | 2.4% | 19.1 |
| 1990-2015 | 39.4% | 2.7% | 25.3 |

Figure 2: The table shows the median of monthly payout ratios, the arithmetic averages of the rolling 10 year real EPS growth rates and the arithmetic CAPE average over the indicated time frames in the S&P 500. Source: Shiller [2015] and own calculations.

### 2.2. CAPE criticism II:
accounting standards

Another point of criticism raised by Siegel [2014] addresses changes in accounting standards. Shiller calculates the US CAPE on the basis of reported earnings, which were long considered to be the best indicator of a company's economic strength. As the US accounting policies are becoming increasingly conservative — e.g. the introduction of fair-value goodwill accounting in 2001, which leads to impairment losses in times of recession without later permitting reversals of impairment losses, or the fact that it is not possible to capitalise research expenses — reported earnings may underestimate the real earnings potential of a company.

For this reason, Siegel recommends using alternative and less conservative earnings indicators, such as the NIPA earnings (National Income and Product Accounts) published by the Bureau of Economic Analysis, which reflect the earnings of all US companies and also take into account the income generated abroad.

The higher NIPA earnings would indeed relativize the high CAPE levels of recent years. Nevertheless, this approach is also open to controversy: NIPA earnings represent the entire US economy and not only the S&P 500, which has a different composition. There is also no comparable long history for NIPA earnings to empirically prove this theory, as they are regularly revised and updated[6]. What's more, changes in accounting standards are not something new to the last few decades and CAPE's concept of cyclical earnings adjustment only adds value after smoothing for exceptional earnings.

### 2.3. CAPE criticism III:
fundamental methodological weaknesses

In addition to declining payout ratios and differing accounting standards, the comparability of CAPE can also be limited by structural changes in the index composition. The presumption that an average 10-year level of profit adequately reflects the earnings potential of a market assumes a stable market structure. However, this is not always the case in smaller countries or in phases of structural change. Take the MSCI Greece for example, which had a CAPE value of 2 in May 2015: the number of companies in the MSCI Greece has fluctuated over the last 10 years between a high of 21 in 2005 and a low of 2 in 2013. In the face of such variations, the question is whether the aggregate corporate profits of these different companies adequately reflect the earnings strength of the 10 companies currently represented in the index, and to what extent a return to the 10-year average is realistic, given that it was greatly determined by the high profits of a now defunct financial industry. A comparison with the broader and more structurally stable MSCI Greece Investable Market Index (IMI), with a CAPE valuation that is six times higher, gives a reason for doubt (Figure 3)[7].

This suggests that it might be wiser to use alternative indicators to CAPE in markets undergoing structural changes. In any case, we need to ask ourselves why CAPE should be any better at forecasting future returns than other fundamental indicators. It does indeed seem plausible that CAPE is superior to classic price-to-earnings and price-to-cash-flow ratios, due to the high volatility of profits and cash flows. Also dividend yields (DY) can hardly be considered as a reliable indicator, given their constant decline in the US over the past few decades, thus, contradicting the mean reversion assumption that is necessary for this forecast. Furthermore, international dividend policies vary considerably.

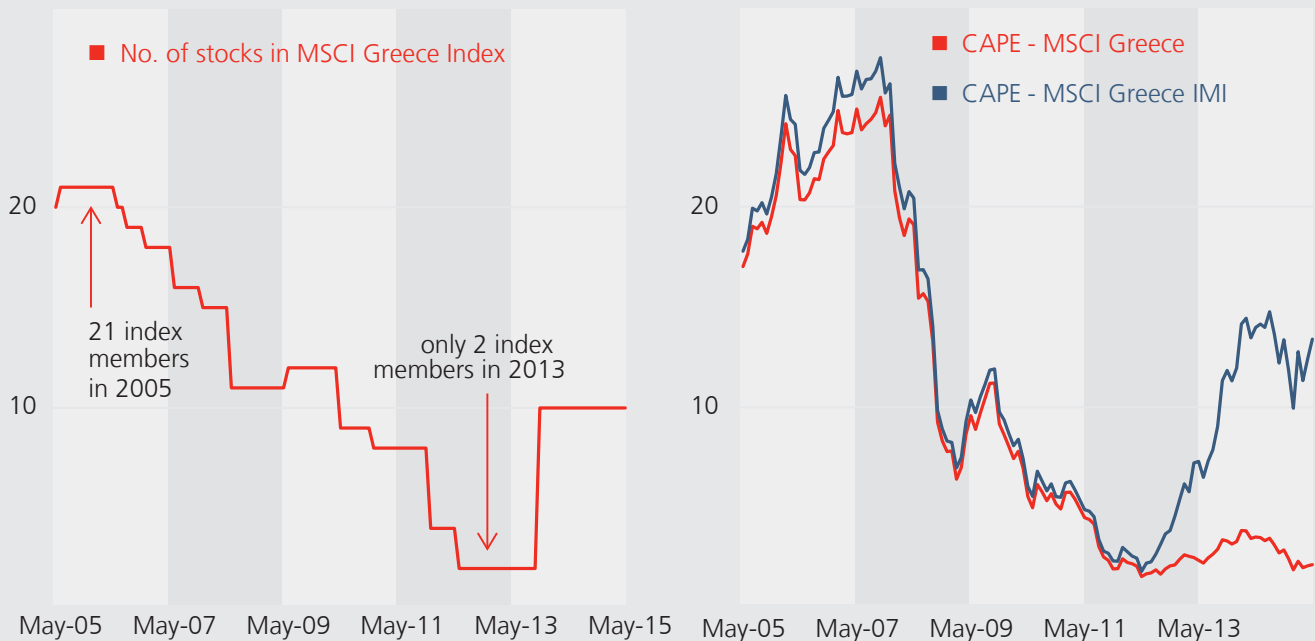## Structural breaks may dampen explanatory power of CAPE



Figure 3: The left chart shows the number of constituents of the MSCI Greece since 05/2005. The right chart shows the CAPE of the MSCI Greece and MSCI Greece Investable Market Index (IMI). The more stable Investable Market Index (IMI) had more than 20 constituents at all times. Source: MSCI and own calculations.

What is not clear is the extent of the relationship between the price-to-book ratio (PB) and future stock market returns. Price-to-book ratios are not just considered to be a frequently used value proxy at a company level, book values are also subject to much milder fluctuations than corporate earnings. This makes both a 10-year smoothing of the book value as well as the related problematic assumption of a constant market structure over the past decade unnecessary. Hence, there are plausible theoretical reasons for also taking PB into account in determining the long-term stock market outlook.

In summary, looking at the criticisms mentioned above, there are primarily three questions which need to be reviewed empirically below:

A    Is it also possible to see a relationship between CAPE and subsequent long-term returns in international markets, and how big are the regional differences?

B    Does the adjustment for different payout ratios improve the significance of CAPE and its international comparability?

C    Does CAPE enable more dependable earnings forecasts than other key indicators, even when considering the impact of structural changes?

When looking at historical data, it is almost impossible to say to what extent accounting changes in the US market affect CAPE's ability to forecast S&P 500 developments. For this reason, this issue will not be pursued in the following empirical analysis.

# 3

# Empirical analysis

## 3.1. Data sources

This research is based on all MSCI Country indexes that have at least 30 years of EPS data available for the period December 1969 to May 2015. As CAPE needs a 10-year earnings average and the results of the various indicators should be comparable, all valuations begin in December 1979. For all indicators that do not presume a 10-year smoothing of the underlying fundamental indicator, out-of-sample data for up to 10 years is also provided for analysis. This paper looks not only at CAPE, as calculated by Shiller [2015], and CAPE_adj, which is adjusted for payout ratios, but also at all common fundamental indicators available from MSCI: in addition to the classic price-to-book ratio (PB), it also considers the price-to-earnings ratio (PE), the price-to-cash-flow ratio (PC) and the dividend yield (DY). Negative fundamental indicators are not included in this research[8].

Insofar as possible, the paper draws on S&P 500 data from Shiller [2015] as this stretches back to 1881. In order to illuminate possible differences between the MSCI USA and the S&P 500, figures for both are given

as of 1979.Depending on the indicator, the countries are divided into two groups. "MSCI Countries" incorporates all monthly observation values of the 17 MSCI Country indexes. In addition, whenever data is also available for the S&P 500 since 1881, this paper also includes a second "All Countries" group, which includes the S&P 500 since 1881 rather than the MSCI USA since 1979.

In order to gauge the relationship among fundamental indicators and long-term subsequent returns, existing research generally looks at fixed forecast periods of 10 or 15 years. As realised subsequent returns depend to a large extent on the valuation at the end of the forecasting period, and even relatively stable indicators such as CAPE regularly fluctuate between 10 and 25, point-to-point forecasts can hide the true relationship. Consequently, we evaluate subsequent long-term returns based on the average subsequent returns for a period of 10 to 15 years, adjusted for inflation, including dividends and in local currency[9]. The inflationary adjustment is based on regional consumer price indexes retrieved from Datastream.

Below, we take a closer look at the relationship between valuations and subsequent long-term returns for the cyclically adjusted CAPE, the CAPE adjusted for changing payout ratios (CAPE_adj) and the price-to-book ratio. In the interest of clarity, the results of the other fundamental indicators are analysed in the summary.

## 3.2. CAPE

In the largest available data sample — "All Countries", which includes 16 MSCI Country indexes from 1979 to 2015, as well as the S&P 500 for the period 1881-2015 — an average CAPE of 20.1 was measured. However, the average CAPEs for the 17 individual countries vary significantly from 14.8 in the Netherlands to 43.2 in Japan, with a relative standard deviation of 31.7% across all the countries. Differences among the countries and the average CAPE of 16.6 in the S&P 500 since 1881 might be partially explained by a short time period from

## CAPE distribution in all countries

| | Start | Maximum | 75% | Median | Mean | 25% | Minimum |
|---|---|---|---|---|---|---|---|
| Australia | Dec. 1979 | 30.2 | 19.8 | 16.5 | 17.2 | 14.3 | 7.7 |
| Belgium | Dec. 1979 | 31.9 | 19.6 | 14.6 | 15.4 | 11.2 | 4.8 |
| Canada | Dec. 1979 | 60.1 | 27.7 | 19.4 | 21.4 | 14.5 | 6.0 |
| Denmark | Dec. 1979 | 64.8 | 30.7 | 24.1 | **24.5** | 14.1 | 4.0 |
| France | Sep. 1981 | 57.4 | 27.3 | 19.5 | 21.9 | 14.5 | 6.1 |
| Germany | Dec. 1979 | 57.4 | 23.0 | 17.9 | 20.6 | 15.1 | 7.8 |
| Hong Kong | Okt. 1990 | 33.0 | 20.4 | 18.7 | 18.3 | 15.8 | 8.5 |
| Italy | Apr. 1994 | 53.5 | 25.6 | 21.5 | 22.1 | 10.2 | 6.2 |
| Japan | Dec. 1979 | 91.5 | 60.3 | 38.1 | **43.2** | 23.9 | 15.8 |
| Netherlands | Dec. 1979 | 37.9 | 16.4 | 12.6 | 14.8 | 10.5 | 4.6 |
| Norway | Dec. 1979 | 29.1 | 18.4 | 14.1 | 15.7 | 12.2 | 6.8 |
| Singapore | Dec. 1982 | 38.1 | 27.2 | 21.8 | 22.1 | 16.6 | 9.8 |
| Spain | Jan. 1990 | 39.6 | 23.3 | 15.6 | 18.3 | 12.3 | 6.4 |
| Sweden | Dec. 1979 | 81.0 | 26.4 | 20.6 | **23.0** | 16.8 | 4.8 |
| Switzerland | Dec. 1979 | 56.9 | 25.8 | 19.6 | **21.9** | 15.6 | 7.1 |
| UK | Dec. 1979 | 26.9 | 18.0 | 15.0 | 15.3 | 12.6 | 6.0 |
| USA | Dec. 1979 | 45.6 | 24.4 | 19.6 | 20.3 | 14.1 | 6.4 |
| S&P 500 since 1979 | Dec. 1979 | 44.2 | 26.1 | 21.1 | 21.4 | 15.2 | 6.6 |
| S&P 500 since 1881 | Jan. 1881 | 44.2 | 20.1 | 16.0 | 16.6 | 11.7 | 4.8 |
| MSCI Countries | Dec. 1979 | 91.5 | 24.6 | 18.3 | 21.0 | 13.6 | 4.0 |
| All Countries | | 91.5 | 23.6 | 17.7 | 20.1 | 13.2 | 4.0 |
| Relative standard deviation (all countries) | | | | 30.3% | 31.7% | | |

Figure 4: The table shows the CAPE distribution by country for the observation period from the start of data ("Start") to 05/2015. The "Maximum" ("Minimum") represents the maximum (minimum) monthly CAPE, "75%" ("25%") the 75th (25th) percentile. The arithmetic average ("Mean") is shown in addition to the "Median". "MSCI Countries" contains all countries except for the S&P 500, whereas "All Countries" contains the S&P 500 since 01/1881 instead of the MSCI USA. To ascertain the distribution of the regionally different average valuation levels, the table contains the relative standard deviation of the 17 average of all countries included in the group "All Countries". Average valuation levels that have not occurred in the S&P 500 in any sequential 35-year periods since 01/1881 are marked bold (Italy, Singapore and France are not outliers but their CAPE lies beyond the S&P 500 range because data availability made it necessary to calculate them for shorter time periods). The grey rows "USA" (MSCI USA), "S&P 500 since 1979" (S&P 500 since 12/1979 based on Shiller data) and "MSCI Count." (only MSCI Countries) are shown for informational purposes only and are not included in "All Countries". Source: MSCI, Shiller [2015] and own calculations.

1979 to 2015, which covers only 35 years. If considering the average CAPE for the S&P 500 for all rolling 35-year periods since 1881, then here, too, the average CAPEs range from 12.3 to 21.4. As such, the large majority of mean values measured for each of the countries have already been seen in comparable time periods in the S&P 500. Only Denmark and Japan deviate markedly from the US experience (Figure 4).

Overall, we see strong regional differences and a tendency to higher valuations than in the S&P 500 since 1881. Both the US stock market and the "MSCI Countries" group had an average CAPE of just over 20 for the period 1979-2015, a valuation premium of some 30% compared to the S&P 500's average CAPE of 16.6 since 1881. This could be the result of below average stock market returns or higher fair valuation levels due to regional or period-specific features. In order to answer this question, this paper will now look at the relationship between CAPE and the average returns over the subsequent 10 to 15 years.

In all countries a relationship between fundamental valuation and subsequent long-term returns can be observed. With the exception of Denmark, a low CAPE of below 15 was always followed by greater returns than a high CAPE. Despite the differing and comparatively shorter periods of time looked at, with only two independent 10-15-year periods, and despite the different accounting standards and regional differences, the following can be said of all 17 countries: in the "All Countries" group based on 4889 observation periods, attractive CAPE levels of below 10 were followed by average capital growth of 11.7% p.a. over the following 10 to 15 years. The majority of the subsequent returns ranged from 9.9% to 13.9%, and even in the least favourable case (Canada) real subsequent returns of 4.9% p.a. were measured (Figure 5).

## Relationship between CAPE and average real returns of the subsequent 10-15 years (p.a.)

| Country | # | R² | Cor | 0-10 Min/25% | 0-10 Med | 0-10 Max/75% | # | 10-15 Min/25% | 10-15 Med | 10-15 Max/75% | # | 15-20 Min/25% | 15-20 Med | 15-20 Max/75% | # | 20-25 Min/25% | 20-25 Med | 20-25 Max/75% | # | 25-30 Min/25% | 25-30 Med | 25-30 Max/75% | # | >=30 Min/25% | >=30 Med | >=30 Max/75% | # | R² Δ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Australia | 246 | 0.85 | -0.91 | 10%/11% | 12.0% | 13%/12% | 19 | 6%/8% | 8.5% | 11%/9% | 103 | 5%/7% | 7.4% | 9%/8% | 98 | 4%/5% | 4.9% | 6%/5% | 25 | 4%/4% | 3.6% | 4%/4% | 1 | | | | | 0.00 |
| Belgium | 246 | 0.67 | -0.83 | 14%/16% | 16.4% | 19%/17% | 42 | 6%/8% | 9.1% | 16%/15% | 82 | 2%/5% | 7.7% | 15%/12% | 52 | -1%/0% | 7.6% | 12%/10% | 47 | -4%/-3% | -2.8% | -1%/-2% | 18 | -4%/-4% | -4.0% | -3%/-4% | 5 | 0.00 |
| Canada | 246 | 0.01 | -0.23 | 5%/6% | 7.3% | 9%/8% | 22 | 2%/6% | 7.6% | 9%/8% | 102 | 1%/7% | 9.4% | 10%/10% | 53 | 8%/9% | 9.3% | 10%/10% | 25 | 6%/6% | 7.0% | 8%/7% | 14 | 2%/5% | 5.3% | 6%/6% | 30 | -0.02 |
| Denmark | 246 | 0.23 | -0.50 | 7%/9% | 10.3% | 14%/13% | 71 | 5%/7% | 9.1% | 12%/11% | 40 | 7%/8% | 8.0% | 12%/9% | 45 | 7%/7% | 9.1% | 11%/10% | 12 | 9%/11% | 11.4% | 12%/12% | 25 | 4%/6% | 6.6% | 11%/8% | 53 | -0.04 |
| France | 225 | 0.69 | -0.87 | 13%/13% | 13.7% | 15%/14% | 26 | 11%/9% | 12.1% | 15%/12% | 18 | 7%/8% | 8.4% | 14%/10% | 85 | 4%/7% | 8.3% | 12%/10% | 46 | 2%/-1% | 9.4% | 10%/10% | 23 | -2%/-1% | 0.2% | 2%/1% | 27 | 0.00 |
| Germany | 246 | 0.85 | -0.94 | 9%/10% | 10.2% | 11%/11% | 39 | 7%/9% | 10.1% | 13%/10% | 44 | 5%/6% | 7.1% | 11%/8% | 86 | 5%/4% | 6.3% | 8%/7% | 36 | 4%/4% | 3.9% | 5%/4% | 4 | -2%/0% | 0.7% | 3%/1% | 37 | 0.01 |
| Hong Kong | 116 | 0.90 | -0.93 | 10%/11% | 11.0% | 12%/11% | 3 | 7%/8% | 8.5% | 10%/9% | 19 | 5%/6% | 6.4% | 8%/7% | 51 | 4%/5% | 5.2% | 6%/6% | 38 | 4%/4% | 4.3% | 5%/4% | 3 | 3%/3% | 2.7% | 3%/3% | 2 | 0.00 |
| Italy | 74 | 0.98 | -0.98 | | | | | | | | | 5%/6% | 6.4% | 7%/7% | 29 | 2%/4% | 4.0% | 6%/5% | 11 | 0%/1% | 0.9% | 2%/1% | 5 | -5%/-4% | -3.1% | -1%/-3% | 29 | 0.01 |
| Japan | 246 | 0.90 | -0.89 | | | | | | | | | 8%/8% | 9.3% | 10%/10% | 25 | 6%/7% | 7.3% | 8%/8% | 22 | 1%/1% | 4.4% | 6%/5% | 17 | -7%/-3% | -1.4% | 4%/0% | 182 | 0.07 |
| Netherlands | 246 | 0.90 | -0.95 | 11%/15% | 15.3% | 18%/16% | 76 | 7%/9% | 10.6% | 15%/14% | 102 | 4%/5% | 6.1% | 7%/7% | 25 | 2%/2% | 2.5% | 3%/3% | 5 | -1%/-1% | -0.2% | 1%/0% | 13 | -2%/-2% | -1.4% | 0%/-1% | 25 | 0.03 |
| Norway | 246 | 0.30 | -0.49 | 7%/9% | 10.7% | 13%/12% | 28 | 4%/7% | 7.2% | 10%/8% | 111 | 2%/4% | 7.1% | 10%/9% | 72 | 5%/6% | 6.6% | 9%/8% | 23 | 4%/4% | 4.7% | 6%/5% | 12 | | | | | -0.01 |
| Singapore | 210 | 0.72 | -0.85 | 10%/10% | 9.8% | 10%/10% | 1 | 6%/7% | 7.4% | 10%/8% | 12 | 4%/5% | 6.7% | 9%/8% | 23 | 3%/4% | 4.4% | 7%/5% | 61 | 1%/3% | 3.4% | 6%/4% | 66 | 1%/2% | 2.3% | 5%/3% | 47 | 0.01 |
| Spain | 125 | 0.99 | -0.99 | 14%/14% | 14.1% | 14%/14% | 3 | 10%/11% | 11.6% | 13%/12% | 64 | 7%/9% | 9.7% | 11%/10% | 20 | 4%/5% | 5.1% | 6%/5% | 7 | 2%/3% | 3.1% | 4%/4% | 5 | -1%/0% | 0.8% | 2%/1% | 26 | 0.01 |
| Sweden | 246 | 0.78 | -0.93 | 15%/16% | 17.0% | 20%/19% | 34 | 13%/14% | 14.8% | 18%/17% | 37 | 10%/12% | 13.0% | 18%/15% | 56 | 11%/12% | 12.5% | 15%/14% | 55 | 10%/11% | 11.0% | 12%/11% | 21 | -1%/4% | 5.1% | 9%/6% | 43 | -0.05 |
| Switzerland | 246 | 0.58 | -0.88 | 7%/8% | 10.9% | 13%/12% | 46 | 12%/12% | 12.9% | 15%/13% | 43 | 10%/11% | 11.4% | 14%/12% | 76 | 8%/9% | 9.0% | 10%/9% | 27 | 6%/6% | 6.8% | 8%/7% | 13 | -1%/1% | 1.3% | 5%/2% | 41 | -0.01 |
| UK | 246 | 0.86 | -0.96 | 11%/12% | 12.3% | 14%/13% | 53 | 6%/8% | 9.7% | 12%/11% | 66 | 3%/5% | 6.2% | 10%/7% | 90 | 1%/1% | 1.2% | 3%/2% | 25 | 0%/0% | 0.5% | 1%/1% | 12 | | | | | 0.01 |
| USA | 246 | 0.83 | -0.95 | 9%/11% | 11.6% | 14%/13% | 61 | 10%/12% | 12.7% | 14%/13% | 47 | 7%/8% | 8.2% | 12%/10% | 68 | 4%/5% | 6.2% | 8%/7% | 19 | 2%/3% | 3.8% | 5%/4% | 14 | -1%/-1% | -0.4% | 2%/1% | 37 | - |
| S&P s. 1979 | 246 | 0.82 | -0.96 | 9%/11% | 11.7% | 14%/13% | 59 | 10%/12% | 12.4% | 14%/13% | 42 | 7%/8% | 9.6% | 12%/10% | 56 | 4%/6% | 7.3% | 8%/8% | 37 | 2%/3% | 3.9% | 5%/4% | 16 | -1%/-1% | -0.3% | 2%/0% | 36 | - |
| S&P s. 1881 | 1433 | 0.46 | -0.66 | 7%/10% | 10.5% | 16%/12% | 229 | -1%/6% | 8.0% | 16%/12% | 458 | -1%/3% | 6.1% | 12%/7% | 498 | -2%/-1% | 1.9% | 8%/5% | 182 | -1%/-1% | 2.7% | 5%/4% | 28 | -2%/-1% | -0.3% | 2%/0% | 38 | -0.08 |
| MSCI Count. | 3702 | 0.58 | -0.75 | 5%/10% | 12.3% | 20%/15% | 524 | 2%/8% | 9.3% | 18%/12% | 890 | 1%/7% | 7.8% | 18%/10% | 954 | -1%/5% | 6.6% | 15%/9% | 484 | -4%/2% | 4.2% | 12%/7% | 266 | -7%/-1% | 0.5% | 11%/3% | 584 | - |
| All Countries | 4889 | 0.49 | -0.67 | 5%/10% | 11.7% | 20%/14% | 692 | -1%/7% | 8.7% | 18%/12% | 1301 | -1%/6% | 7.2% | 18%/12% | 1384 | -2%/3% | 5.7% | 15%/9% | 647 | -4%/2% | 4.1% | 12%/7% | 280 | -7%/-1% | 0.5% | 11%/3% | 585 | - |

Figure 5: The table shows the average returns (median, "Med") over the subsequent 10-15 years depending on the CAPE in each country as well as the statistical relationship by reference to "R²" and the correlation ("Cor"). All returns are measured in local currency, incl. dividends, annualised and inflation-adjusted (using local CPI indexes from Datastream). The analysis of the single countries spans the time frame from 12/1979 to 05/2015 insofar fundamental and performance data was available (Source: MSCI, own calculations). For the USA, data starting from 01/1881 (Source: Shiller [2015]) was additionally considered. The last performance time frame is the period from 05/2000 to 05/2015. The row "All Countries" spans all 4889 months in the sample ("#"). The "Max" and "Min" columns represent the maximum and minimum of returns observed in the country, "75%" ("25%") the 75th (25th) percentile of real 10-15 years returns. The grey rows "USA" (MSCI USA), "S&P s. 1979" (S&P 500 since 12/1979 based on Shiller data) and "MSCI Count." (only MSCI Countries) are shown for informational purposes only and are not included in "All Countries". The "R² Δ" column indicates the extent to which the R² of "All Countries" changes without the respective country.

While attractive valuations were followed by high returns, CAPE levels of more than 30 led to low returns of 0.5% on average. The Japanese stock market stands out because of the low correlation to other stock markets, the above-average CAPE of partially over 50 and extremely negative subsequent returns. Thereby Japan improves the international relationship between CAPE and subsequent long-term returns (Figure 6). Not including the Japanese stock market would considerably weaken the coefficient of determination (R²) of "All Countries" decreasing it by 0.07 to 0.42.

In comparison, the S&P 500, Sweden and Denmark tend to reduce the relationship between CAPE and subsequent long-term returns. If these markets were not included, the R² of "All Countries" would increase to 0.69. The negative contribution of the S&P 500 stems from the lower valuations between 1881 and 1979. In the case of Sweden and Denmark, structural changes might explain the weakened relationship.

Since CAPE puts the current price in relation to the average earnings of the previous 10 years, it seems probable that the significance of the indicator, as well as its comparability with its own history and other countries, is reduced when the index is exposed to structural changes, for example, as a result of substantial changes to industry weightings or fluctuating index constituents, or when earnings growth rates diverge considerably.

In fact, Denmark recorded average annual earnings growth of 3.2% for the period 1969-2015, which is significantly higher than the 1.8% recorded by the S&P

## Relationship between CAPE and average real returns of the subsequent 10-15 years (p.a.)



$$y = -0.066\ln(x) + 0.2575$$
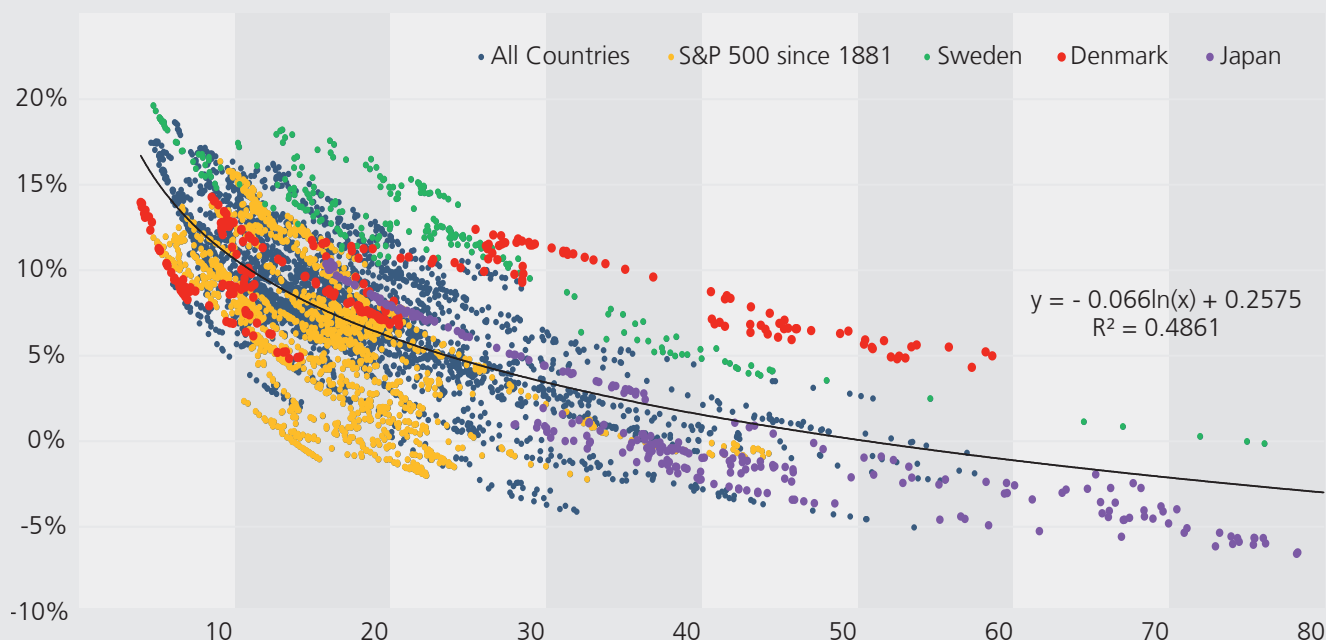$$R^2 = 0.4861$$

Figure 6: This chart shows the relationship between CAPE and the returns of the subsequent 10-15 years for the periods 01/1881-05/2015 (S&P 500) and 12/1979-05/2015 (other MSCI Countries). The three countries that had the highest absolute effect in terms of "R² Δ", as well as Japan, have been highlighted. All return data is adjusted for inflation, in local currency, incl. dividend income and annualised. The regression function applies to "All Countries". Source: S&P 500: Shiller [2015], other countries: MSCI and own calculations.

500 for the same period. Moreover, the number of constituents in the MSCI Denmark declined from over 20 in 1994 to just 11 in 2011 (Figure 7). During this period, the weighting of the healthcare sector increased from 10% to 60%. When an index is subject to such major structural shifts, it is questionable whether the profit

## Structural changes in the MSCI Country indexes

| MSCI Country | EPS growth (1969-2015) | Δ vs. US EPS growth since 1871 | Number of stocks in MSCI Country index | | |
|---|---|---|---|---|---|
| | | | Mininum | Maximum | Difference |
| Australia | 1.6% | 0.2% | 47 | 89 | 47% |
| Belgium | 1.0% | 0.8% | 11 | 22 | 50% |
| Canada | 2.0% | 0.2% | 76 | 119 | 36% |
| Denmark | 3.2% | 1.4% | 11 | 25 | 56% |
| France | 0.8% | 1.0% | 54 | 78 | 31% |
| Germany | 1.9% | 0.0% | 45 | 69 | 35% |
| Hong Kong | 5.1% | 3.2% | 28 | 54 | 48% |
| Italy | 1.9% | 0.1% | 23 | 68 | 66% |
| Japan | 1.4% | 0.5% | 266 | 398 | 33% |
| Netherlands | 0.9% | 1.0% | 19 | 27 | 30% |
| Norway | 3.7% | 1.8% | 8 | 25 | 68% |
| Singapore | 3.8% | 2.0% | 27 | 41 | 34% |
| Spain | 1.8% | 0.1% | 22 | 35 | 37% |
| Sweden | 5.8% | 4.0% | 28 | 49 | 43% |
| Switzerland | 1.9% | 0.1% | 31 | 55 | 44% |
| UK | 1.1% | 0.7% | 102 | 160 | 36% |
| USA | 1.9% | 0.1% | 316 | 638 | 50% |

Figure 7: The real geometric earnings growth rates of the MSCI Country indexes were calculated on a per annum basis in local currencies from 12/1969 to 05/2015. The minimum and maximum numbers of constituents as well as the percentage "Difference" in the MSCI indexes are based on the time frame 03/1994-05/2015 (depending on data availability). Source: MSCI and own calculations. The "Δ vs. US EPS growth since 1871" displays the deviation from the earnings growth of the S&P 500 for the period 01/1871-05/2015 (1.8%). Source: Shiller and own calculations.

level of the past 10 years can be at all representative for the future and whether CAPE can assess the fundamental strength of a market in a meaningful way.

Deviations of more than 1 percent from the US earnings growth were not just seen in Denmark but also in Hong Kong, Norway, Singapore and Sweden. Removing these countries from the study would increase the R² of "All Countries" from 0.49 to 0.58. The same result is achieved if all markets that have undergone sector changes of over 10% in the last two decades are removed — that is Australia, Belgium, Canada, Denmark, Italy, Netherlands, Norway and Sweden. The overall relationship is improved to a similar extent if markets are removed that have repeatedly stood out in terms of earnings growth, sectoral changes and company figures. Therefore, the findings suggest that the quality of CAPE-based forecasts diminishes with increasing structural change within a market.

From an investor's point of view, it is not only relevant to have a reliable estimate of possible returns but also of

future market risks, especially in the form of maximum losses. Thus, the question is whether the CAPE valuation can also be used to forecast risks. The following section examines the maximum drawdowns depending on CAPE for "All Countries" over the subsequent 3 and 15 years respectively.

As illustrated in Figure 8, losses of more than -50% over the following three years were observed in all valuation intervals. Hence, an attractive valuation does not necessarily provide protection against major losses on the stock market. Nevertheless, the maximum drawdowns increase significantly as the valuation increases. In the worst case, a CAPE level of less than 10 was followed by a setback of -51.0% over the next three years, whereas higher CAPE levels of over 30 saw disproportionately higher setbacks of -76.8%. The average maximum drawdowns over the subsequent 3 and 15 years respectively exhibit the same relationship: higher valuations are accompanied by higher downside risks. Unsurprisingly, this is also true for each individual market as the correlation between CAPE and stock market
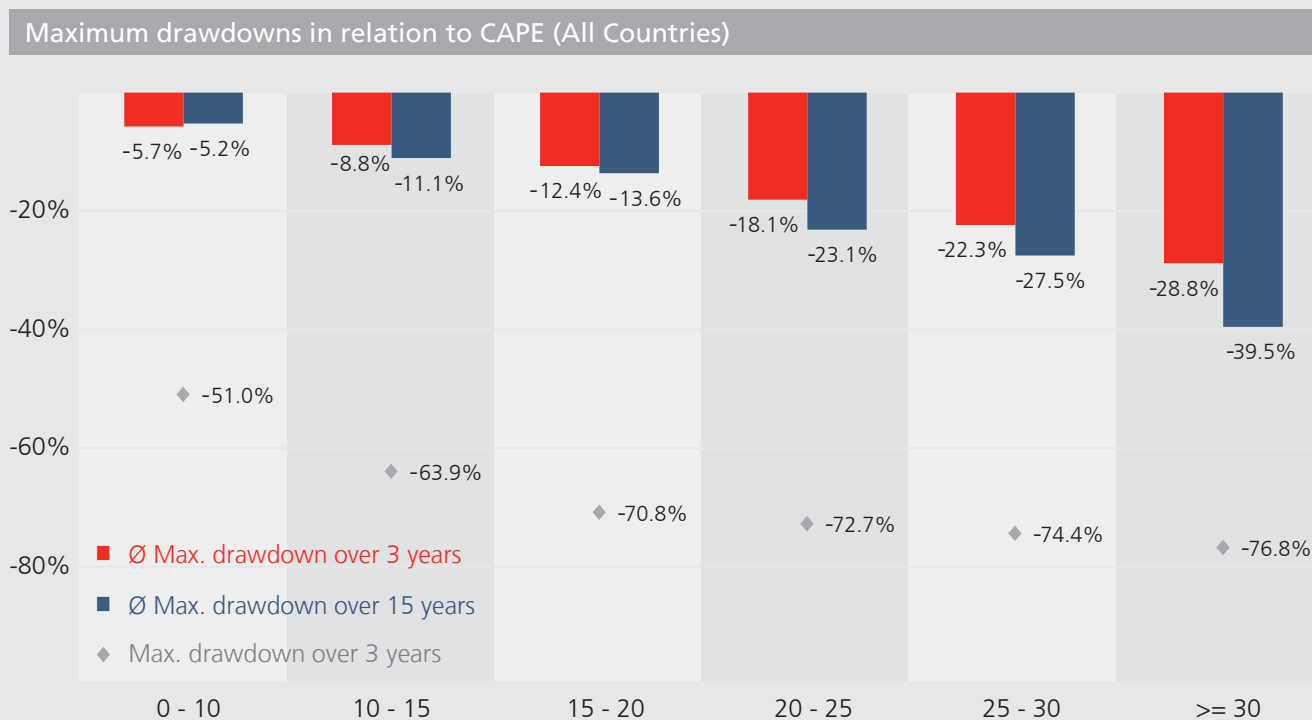


**Maximum drawdowns in relation to CAPE (All Countries)**

- ■ Ø Max. drawdown over 3 years
- ■ Ø Max. drawdown over 15 years
- ◆ Max. drawdown over 3 years

| CAPE | 3 yr avg | 15 yr avg | Max 3 yr |
|------|----------|-----------|----------|
| 0 - 10 | -5.7% | -5.2% | -51.0% |
| 10 - 15 | -8.8% | -11.1% | -63.9% |
| 15 - 20 | -12.4% | -13.6% | -70.8% |
| 20 - 25 | -18.1% | -23.1% | -72.7% |
| 25 - 30 | -22.3% | -27.5% | -74.4% |
| >= 30 | -28.8% | -39.5% | -76.8% |

Figure 8: The chart shows the relationship between CAPE and the following maximum drawdown in "All Countries" in the period from 01/1881 to 05/2015 (S&P 500) and 12/1979-05/2015 (other MSCI Countries). The maximum drawdown over 3/15 years describes the maximum loss an investor could have suffered over the next 3/15 years, assuming an investment was made on the valuation date. All returns are inflation-adjusted, in local currency, incl. dividend income. Source: S&P 500: Shiller [2015], other countries: MSCI as well as own calculations.

development is rather strong. The fact that this applies to "All Countries" is an evidence of an internationally comparable relationship.

In summary, we have not only been able to establish a relationship among CAPE and subsequent long-term returns as well as risk exposures in the S&P 500 since 1881 but also a strong link with international markets since 1979. As the observation period comprises only two independent 10-15-year periods, it is difficult to say whether different countries have different fair CAPE levels. Given that similar valuations generally led to similar long-term returns and potential losses, and globalisation leads to a harmonisation of accounting standards and investor behaviour, it seems likely that an internationally comparable relationship does indeed exist — at least in markets with a constant and comparable structure. In general, the comparability with a country's own history and among countries seems to decrease with structural changes. For this reason, the following section takes a look at whether CAPE becomes more reliable as an indicator once adjusted for different payout ratios.

### 3.3 CAPE adjusted for different payout ratios (CAPE_adj)

CAPE_adj, which is a version of CAPE that also takes into account changes in different payout ratios, sets the market price in relation to a theoretical total return EPS-index with a constant payout ratio of 0%, assuming complete reinvestment of corporate profits or complete share buybacks. The reinvestment of all corporate profits leads to higher earnings growth rates and to valuations about 20% higher than classic CAPE (Figure 9).

In line with the prior findings, the average CAPE_adj of the S&P 500 since 1979 quotes at 24.2, well above its historical average of 20.1 since 1881. However, this overvaluation of 20% is still lower than CAPE's 29%. As such, approximately one-third of the comparatively high valuations in recent decades could be attributed to changes in dividend policy. However, does the adjustment improve the comparability among different stock markets?

In "All Countries", an average CAPE_adj of 23.1 was

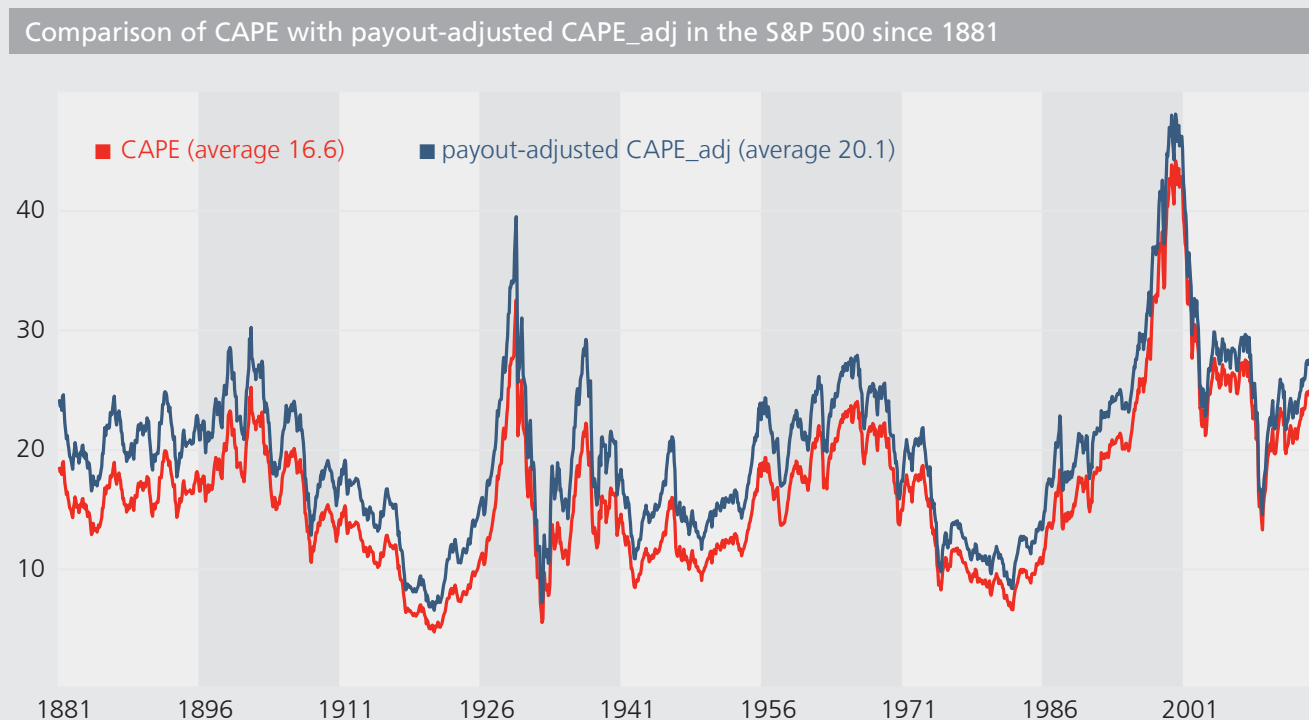**Comparison of CAPE with payout-adjusted CAPE_adj in the S&P 500 since 1881**

Figure 9: The chart displays CAPE in comparison to CAPE_adj in the S&P 500 for the period 01/1881-05/2015. The averages provided refer to the entire period. Source: Shiller [2015] and own calculations.

## CAPE_adj distribution in all countries

|  | Start | Maximum | 75% | Median | Mean | 25% | Minimum |
|---|---|---|---|---|---|---|---|
| Australia | Dec. 1979 | 35.7 | 23.7 | 20.4 | 20.8 | 17.7 | 9.7 |
| Belgium | Dec. 1979 | 38.4 | 23.7 | 18.2 | 19.2 | 14.7 | 5.7 |
| Canada | Dec. 1979 | 65.1 | 30.5 | 22.1 | **24.2** | 17.2 | 7.4 |
| Denmark | Dec. 1979 | 67.9 | 33.4 | 25.9 | **26.8** | 16.7 | 5.2 |
| France | Sep. 1981 | 62.3 | 30.8 | 21.6 | 24.8 | 17.5 | 8.4 |
| Germany | Dec. 1979 | 62.0 | 25.6 | 20.3 | 23.0 | 17.1 | 9.4 |
| Hong Kong | Oct. 1990 | 39.0 | 24.0 | 21.9 | 21.5 | 18.8 | 10.1 |
| Italy | Apr. 1994 | 58.9 | 29.7 | 24.7 | 25.3 | 12.6 | 7.7 |
| Japan | Dec. 1979 | 96.3 | 63.6 | 39.7 | **45.5** | 26.3 | 18.1 |
| Netherlands | Dec. 1979 | 42.4 | 19.7 | 15.2 | 17.7 | 13.2 | 6.3 |
| Norway | Dec. 1979 | 33.3 | 21.0 | 16.7 | 18.0 | 14.3 | 8.4 |
| Singapore | Dec. 1982 | 41.0 | 29.6 | 24.1 | **24.4** | 18.3 | 10.5 |
| Spain | Jan. 1990 | 45.3 | 26.6 | 18.7 | 21.6 | 15.3 | 8.2 |
| Sweden | Dec. 1979 | 86.5 | 29.3 | 23.9 | **25.8** | 19.2 | 6.2 |
| Switzerland | Dec. 1979 | 61.5 | 28.0 | 21.7 | 24.1 | 17.5 | 8.3 |
| UK | Dec. 1979 | 30.8 | 21.3 | 18.0 | 18.2 | 15.2 | 8.0 |
| USA | Dec. 1979 | 49.6 | 26.6 | 22.3 | 23.1 | 17.4 | 8.3 |
| S&P 500 since 1979 | Dec. 1979 | 48.1 | 28.5 | 24.0 | 24.2 | 18.1 | 8.4 |
| S&P 500 since 1881 | Jan. 1881 | 48.1 | 23.9 | 19.9 | 20.1 | 15.2 | 6.6 |
| MSCI Countries | Dec. 1979 | 96.3 | 27.7 | 21.1 | 23.8 | 16.3 | 5.2 |
| All Countries |  | 96.3 | 26.8 | 20.8 | 23.1 | 16.0 | 5.2 |
| **Relative standard deviation (all countries)** |  |  |  | **24.7%** | **26.9%** |  |  |

Figure 10: The table shows the CAPE_adj distribution by country for the observation period from the start of data ("Start") to 05/2015. The "Maximum" ("Minimum") represents the maximum (minimum) monthly CAPE_adj, "75%" ("25%") shows the 75th (25th) percentile. The arithmetic average ("Mean") is shown in addition to the "Median". "MSCI Countries" contains all countries except for the S&P 500, while "All Countries" contains the S&P 500 since 01/1881 instead of the MSCI USA. To ascertain the distribution of the regionally different average valuation levels, the table contains the relative standard deviation for the 17 average of all countries included in the group "All Countries". Average valuation levels that have not occurred in the S&P 500 in any sequential 35-year periods since 01/1881 are marked bold (Italy and France are not outliers but their CAPE_adj lies beyond the S&P 500 range because data availability made it necessary to calculate them for shorter time periods). The grey rows "USA" (MSCI USA), "S&P 500 since 1979" (S&P 500 since 12/1979 based on Shiller data) and "MSCI Countries" (only MSCI Countries) are shown for informational purposes only and are not included in "All Countries". Source: MSCI, Shiller [2015] and own calculations.

measured, whereas the indicator varied significantly across individual countries, ranging from 17.7 in the Netherlands to 45.5 in Japan. The majority of the average values have already been observed in similarly long 35-year periods in the S&P 500 since 1881, where CAPE_adj ranged from 16.1 to 24.2. Nevertheless, Canada, Denmark, Japan, Singapore and Sweden have all quoted average adjusted CAPEs not yet seen in the S&P 500 (Figure 10).

The average CAPE_adj of all the countries, with a relative standard deviation of 26.9%, was less volatile than the average CAPE deviation of 31.7%. This might mean that adjustment for payout ratios increases the international comparability of CAPE.

Analysis of the forecasting ability of CAPE_adj seems unable to confirm this (see Appendix 1). The relationship between CAPE_adj and long-term subsequent returns is largely comparable with that of CAPE, i.e. attractive valuations were followed by significantly higher returns than were high valuations. Nevertheless, CAPE_adj shows no signs of superiority to ordinary CAPE either in terms of $R^2$ or correlation. This holds for both individual countries, where $R^2$ deteriorated in 9 out of the 16 countries, and the two groups.

Even the drawdowns depending on the valuation do not reveal any significant differences to CAPE and, therefore, are not shown. As a result, there was no empirical evidence for the superiority of CAPE_adj.

### 3.4. Price-to-book ratio (PB)

The PB sets the price of a country index in relation to the accumulated book values of all companies included in that index. As there is no PB available for the S&P 500 since 1881, the following valuations are based solely

## PB distribution in all countries

| | Start | Maximum | 75% | Median | Mean | 25% | Minimum |
|---|---|---|---|---|---|---|---|
| Australia | Dec. 1979 | 3.2 | 2.1 | 1.8 | 1.8 | 1.5 | 0.8 |
| Belgium | Dec. 1979 | 3.5 | 2.1 | 1.6 | 1.6 | 1.3 | 0.5 |
| Canada | Dec. 1979 | 3.3 | 2.1 | 1.8 | 1.9 | 1.5 | 0.8 |
| Denmark | Dec. 1979 | 5.4 | 2.7 | 2.1 | 2.2 | 1.5 | 0.5 |
| France | Sep. 1981 | 4.6 | 2.2 | 1.6 | 1.8 | 1.4 | 0.6 |
| Germany | Dec. 1979 | 4.5 | 2.2 | 1.8 | 1.9 | 1.5 | 1.0 |
| Hong Kong | Oct. 1990 | 3.3 | 1.8 | 1.6 | 1.6 | 1.3 | 0.8 |
| Italy | Apr. 1994 | 4.3 | 2.3 | 1.8 | 1.8 | 1.0 | 0.6 |
| Japan | Dec. 1979 | 5.2 | 2.3 | 2.0 | 2.2 | 1.6 | 0.9 |
| Netherlands | Dec. 1979 | 4.2 | 2.3 | 1.7 | 1.8 | 1.2 | 0.5 |
| Norway | Dec. 1979 | 3.4 | 2.0 | 1.7 | 1.8 | 1.5 | 0.9 |
| Singapore | Dec. 1982 | 2.6 | 1.9 | 1.7 | 1.7 | 1.5 | 0.8 |
| Spain | Jan. 1990 | 3.6 | 2.6 | 1.6 | 1.9 | 1.3 | 0.8 |
| Sweden | Dec. 1979 | 6.2 | 2.5 | 2.2 | 2.2 | 1.7 | 0.5 |
| Switzerland | Dec. 1979 | 5.3 | 2.8 | 2.2 | 2.3 | 1.5 | 0.8 |
| UK | Dec. 1979 | 4.2 | 2.4 | 1.9 | 2.0 | 1.7 | 0.8 |
| USA | Dec. 1979 | 5.8 | 2.9 | 2.4 | 2.5 | 1.9 | 1.0 |
| MSCI Countries | | 6.2 | 2.3 | 1.8 | 2.0 | 1.4 | 0.5 |
| Relative standard deviation (MSCI Countries) | | | | 12.8% | 12.6% | | |

Figure 11: The table shows the PB distribution by country for the period from the start of data ("Start") to 05/2015. The "Maximum" ("Minimum") represents the maximum (minimum) monthly PB, "75%" ("25%") shows the 75th (25th) percentile. The arithmetic average ("Mean") is shown in addition to the "Median". "MSCI Countries" comprises all the listed countries. In order to better judge the volatility of the regionally divergent average valuations, we have also given the relative standard deviation (coefficient of variation) for the Mean values and Medians of the 17 MSCI Countries. Source: MSCI and own calculations.

## Relationship between PB and average real returns of the subsequent 10-15 years (p.a.)

| Country | # | $R^2$ | Cor | 0 - 1 Min/25% | 0 - 1 Med | 0 - 1 Max/75% | # | 1 - 1.5 Min/25% | 1 - 1.5 Med | 1 - 1.5 Max/75% | # | 1.5 - 2 Min/25% | 1.5 - 2 Med | 1.5 - 2 Max/75% | # | 2 - 2.5 Min/25% | 2 - 2.5 Med | 2 - 2.5 Max/75% | # | 2.5 - 3 Min/25% | 2.5 - 3 Med | 2.5 - 3 Max/75% | # | >= 3 Min/25% | >= 3 Med | >= 3 Max/75% | # | $R^2$ Δ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Australia | 246 | 0.86 | -0.91 | 11%/12% | 12.2% | 13%/12% | 16 | 7%/8% | 8.6% | 11%/10% | 98 | 5%/7% | 7.3% | 9%/7% | 98 | 4%/5% | 5.1% | 6%/5% | 28 | 5%/5% | 4.9% | 5%/5% | 6 | | | | | 0.00 |
| Belgium | 246 | 0.85 | -0.94 | 14%/15% | 16.0% | 19%/17% | 62 | 7%/9% | 9.2% | 16%/13% | 64 | 3%/7% | 7.6% | 12%/10% | 78 | -1%/-3% | 0.2% | 8%/1% | 18 | -3%/-3% | -2.5% | -1%/-2% | 14 | -4%/-4% | -3.6% | -3%/-3% | 10 | 0.02 |
| Canada | 246 | 0.10 | -0.36 | 8%/8% | 8.1% | 9%/9% | 7 | 4%/6% | 8.0% | 10%/9% | 79 | 1%/7% | 8.1% | 10%/9% | 115 | 4%/5% | 5.8% | 8%/6% | 39 | 2%/3% | 2.9% | 4%/3% | 6 | | | | | -0.01 |
| Denmark | 246 | 0.35 | -0.60 | 8%/9% | 9.5% | 14%/13% | 35 | 7%/9% | 10.9% | 14%/12% | 65 | 5%/7% | 7.9% | 12%/10% | 59 | 7%/10% | 10.6% | 12%/11% | 42 | 6%/7% | 7.8% | 10%/9% | 15 | 4%/5% | 5.9% | 7%/7% | 30 | -0.03 |
| France | 225 | 0.72 | -0.88 | 13%/13% | 13.7% | 15%/14% | 26 | 8%/9% | 9.8% | 15%/12% | 59 | 5%/7% | 7.9% | 13%/10% | 73 | 2%/1% | 8.6% | 11%/7% | 40 | 0%/1% | 0.8% | 2%/-2% | 8 | -2%/-2% | 0.1% | 1%/0% | 19 | 0.01 |
| Germany | 246 | 0.76 | -0.91 | | | | | 9%/10% | 10.2% | 13%/11% | 45 | 6%/7% | 9.0% | 12%/10% | 78 | 5%/6% | 6.9% | 10%/8% | 63 | 3%/5% | 7.0% | 8%/6% | 21 | -2%/0% | 0.7% | 6%/1% | 39 | 0.01 |
| Hong Kong | 116 | 0.90 | -0.92 | 10%/10% | 10.6% | 12%/11% | 4 | 7%/7% | 7.7% | 10%/9% | 30 | 5%/6% | 6.2% | 7%/6% | 47 | 4%/5% | 5.1% | 7%/6% | 30 | 4%/4% | 4.3% | 5%/4% | 3 | 3%/3% | 2.7% | 3%/3% | 2 | 0.00 |
| Italy | 74 | 0.95 | -0.97 | | | | | 5%/6% | 6.5% | 7%/7% | 25 | 3%/4% | 5.0% | 6%/6% | 14 | -2%/0% | 0.9% | 2%/2% | 7 | -3%/-3% | -2.4% | -1%/-2% | 8 | -5%/-4% | -3.4% | -3%/-3% | 20 | 0.00 |
| Japan | 246 | 0.34 | -0.58 | | | | | | | | | -2%/-1% | 0.9% | 10%/7% | 74 | -3%/-2% | -0.4% | 8%/5% | 90 | -4%/-3% | 2.8% | 4%/3% | 28 | -5%/-5% | -4.4% | 1%/-3% | 54 | 0.00 |
| Netherlands | 246 | 0.93 | -0.97 | 14%/15% | 15.2% | 18%/16% | 74 | 8%/9% | 11.0% | 15%/14% | 85 | 6%/7% | 7.0% | 8%/7% | 32 | 4%/4% | 4.7% | 6%/5% | 12 | -1%/0% | 1.0% | 3%/2% | 9 | -2%/-2% | -1.2% | 2%/-1% | 34 | 0.05 |
| Norway | 246 | 0.54 | -0.75 | 10%/11% | 11.7% | 13%/12% | 11 | 6%/7% | 8.2% | 12%/9% | 44 | 5%/7% | 7.4% | 11%/9% | 116 | 4%/5% | 5.6% | 10%/7% | 53 | 3%/3% | 3.3% | 4%/4% | 14 | 2%/2% | 2.1% | 3%/2% | 8 | -0.02 |
| Singapore | 210 | 0.62 | -0.76 | 8%/8% | 8.7% | 10%/9% | 4 | 5%/6% | 6.7% | 10%/8% | 34 | 2%/3% | 3.9% | 7%/4% | 117 | 1%/2% | 2.7% | 6%/4% | 52 | 1%/1% | 1.4% | 5%/3% | 3 | | | | | -0.02 |
| Spain | 125 | 0.88 | -0.96 | 12%/12% | 12.2% | 14%/14% | 8 | 9%/11% | 11.3% | 13%/12% | 60 | 9%/10% | 10.4% | 11%/11% | 15 | 3%/4% | 5.1% | 8%/7% | 13 | 1%/1% | 1.7% | 5%/2% | 9 | -1%/0% | 0.8% | 1%/1% | 20 | 0.01 |
| Sweden | 246 | 0.76 | -0.94 | 15%/16% | 17.0% | 20%/19% | 34 | 14%/15% | 16.5% | 18%/17% | 21 | 11%/13% | 13.9% | 18%/15% | 54 | 10%/12% | 12.3% | 15%/14% | 77 | 6%/10% | 11.1% | 13%/12% | 20 | -1%/4% | 4.9% | 8%/6% | 40 | -0.06 |
| Switzerland | 246 | 0.68 | -0.90 | 8%/8% | 11.0% | 13%/12% | 39 | 7%/9% | 12.8% | 15%/13% | 66 | 9%/10% | 11.1% | 13%/12% | 71 | 8%/8% | 8.8% | 9%/8% | 17 | 6%/6% | 6.7% | 8%/7% | 12 | -1%/1% | 1.3% | 5%/2% | 41 | 0.00 |
| UK | 246 | 0.94 | -0.97 | 12%/12% | 12.9% | 14%/13% | 28 | 8%/11% | 11.7% | 13%/12% | 45 | 6%/7% | 7.8% | 11%/10% | 72 | 5%/6% | 6.2% | 9%/6% | 43 | 3%/4% | 4.6% | 5%/5% | 19 | 0%/1% | 0.9% | 3%/2% | 39 | 0.02 |
| USA | 246 | 0.86 | -0.95 | 14%/14% | 13.9% | 14%/14% | 1 | 9%/11% | 11.7% | 14%/13% | 64 | 10%/12% | 12.6% | 14%/13% | 47 | 8%/8% | 8.6% | 12%/10% | 49 | 6%/7% | 7.6% | 8%/8% | 28 | -1%/-1% | 0.7% | 5%/3% | 57 | 0.00 |
| MSCI Count. | 3702 | 0.55 | -0.73 | 8%/12% | 14.1% | 20%/16% | 349 | 4%/8% | 9.9% | 18%/12% | 884 | -2%/6% | 7.7% | 18%/10% | 1160 | -3%/5% | 6.3% | 15%/9% | 673 | -4%/2% | 4.5% | 13%/7% | 223 | -7%/-1% | 0.6% | 8%/2% | 413 | - |

Figure 12: The table shows the average returns (median, "Med") over the subsequent 10-15 years depending on the PB by country as well as the statistical relationship by reference to "R²" and the correlation ("Cor"). All returns are measured in local currency, incl. dividend income, annualised and inflation-adjusted (using local CPI indexes from Datastream). The analysis of the single countries spans the time frame from 12/1979 to 05/2015 insofar fundamental and performance data (for purposes of comparison, for both PBs and CAPE) was available (Source: MSCI, own calculations). The last performance time frame is the period from 05/2000 to 05/2015. The row "MSCI Count." (only MSCI Countries) spans all 3702 months in the sample ("#"). The "Max" and "Min" columns represent the maximum and minimum of returns observed in the country, "75%" ("25%") the 75th (25th) percentile of returns. The column "R² Δ" indicates the extent to which the R² of "MSCI Count." changes without the respective country.

on MSCI data. For the period 1979-2015, the "MSCI Countries" group average PB was 2.0, although there were regional differences, ranging from 1.6 in Hong Kong to 2.5 in the US market. However, the relative standard deviation of the average valuations of the 17 MSCI indexes is less pronounced, at 12.6%, than with CAPE (31.7%) and CAPE_adj (26.9%), which suggests a more stable relationship (Figure 11).

The relationship between PB and subsequent long-term returns appears to be similar to that of CAPE. Both in all the individual countries and in "MSCI Countries", low valuations were followed by much stronger returns than high valuations (Figure 12). In contrast to CAPE, extremely high valuations were not just seen in Japan but in several markets. While the Japanese data definitely improves the relationship between CAPE and subsequent long-term returns, removing the Japanese stock market from the calculation would have had no real impact on PB results.

As MSCI book values for several markets have been available since 1974 and PB does not require a 10-year smoothing, in contrast to CAPE, out-of-sample data for

the period 1974-1979 is available for PB. The consideration of this additional data leads to largely similar results. The 0.5 $R^2$ remains at a high level (Figure 13).

With regard to risk exposure, we see the same phenomenon as with CAPE — higher valuations signal higher risk of losses. In this way, market phases with PB less than 1 saw drawdowns of, on average, only 5.2% over the following three years. Where PB was over 3, investors had to reckon with far higher average drawdowns of 29.8% (Figure 14).

### 3.5.  Summary with respect to PE, PC and DY

The relationship between the fair valuation and long-term subsequent returns for both CAPE and PB is very similar. This outcome also becomes evident in the MSCI data for 1979-2015. In order to guarantee higher comparability among the results of these two indicators, it is necessary to analyse the least and the most expensive 10% of all months observed, instead of using intervals with fixed indicators that have different numbers of signals as



Relationship between PB and average real returns of the subsequent 10-15 years (p.a.)

Legend:
- Out-of-sample
- MSCI Countries
- Sweden
- Denmark
- Japan
- Log (incl. out-of-sample)
- Log (MSCI Countries)

$R^2 = 0.5018$

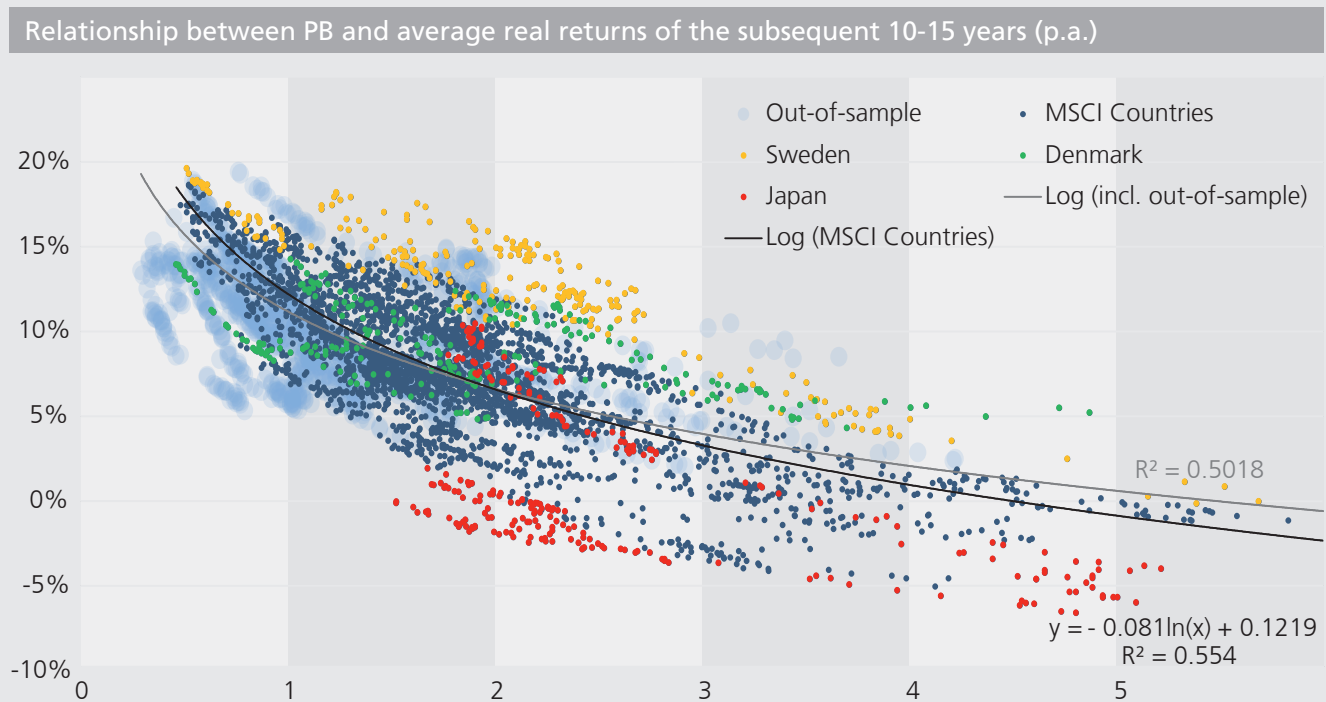$$y = -0.081\ln(x) + 0.1219$$
$$R^2 = 0.554$$

Figure 13: The chart displays the relationship between PB and the returns of the subsequent 10-15 years for the period 12/1979-05/2015. The two countries that had the highest absolute effect in terms of "R² Δ", as well as Japan, are highlighted as examples. All returns are adjusted for inflation, in local currency, incl. dividend income and annualised. The black regression function applies to "MSCI Countries". Out-of-sample data (that is to say data from 12/1974-12/1979 and data since 12/1979 for which no CAPE was available) is shown in light blue and the regression function for all in and out-of-sample data is light grey. Source: MSCI and own calculations.

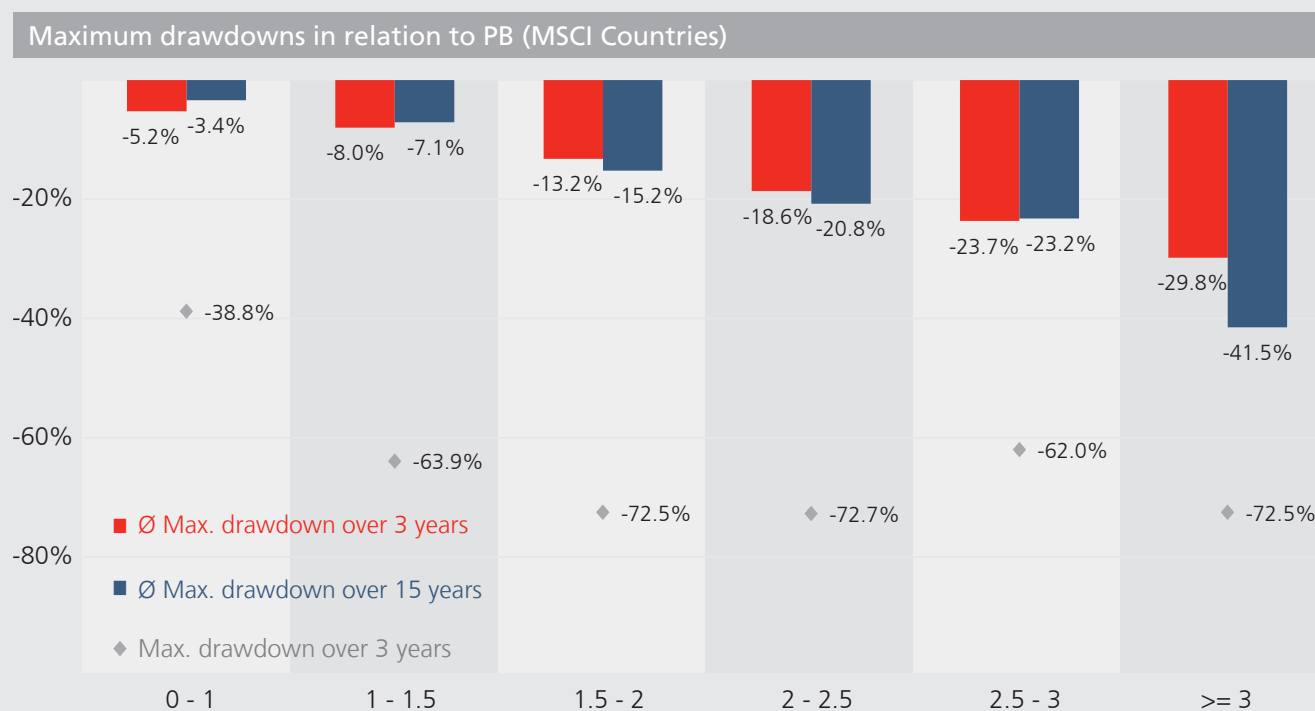## Maximum drawdowns in relation to PB (MSCI Countries)



Figure 14: The chart shows the relationship between PB and the following maximum drawdown in "MSCI Countries" in the period from 12/1979 to 05/2015. The maximum drawdown over 3/15 years describes the maximum loss an investor could have suffered over the next 3/15 years, assuming an investment was made on the valuation date. All returns are inflation-adjusted, in local currency and incl. dividend. Source: MSCI and own calculations.

in previous analysis. Looked at this way, the 10% of months with the lowest CAPE in all 17 MSCI Countries were followed by average real returns of 13.3% over the subsequent 10 to 15 years. For CAPE_adj and PB, it was 12.5% and 13.6% respectively. Similarly, when looking at the most expensive 10% of all months, returns of on average 0.1-0.5% followed subsequently.

The average drawdowns on both high and low valuations are comparable for all three indicators. Thus, there

is neither empirical evidence that CAPE_adj is superior to CAPE nor that PB is inferior to it (Figure 15).

On the contrary, the results may even suggest that PB is superior to CAPE. Not only were attractive valuations followed by higher returns and smaller drawdowns than with CAPE but also the average PBs in the 17 MSCI Countries since 1979 showed much less fluctuation, with a relative standard deviation of 12.6%, which is clearly less than that of CAPE (30.9%). This may speak

## Overview of findings (MSCI Countries)

| MSCI Countries 1979-2015 | Average | Rel. stand. deviation | Ø Performance 10-15 years | | Ø Drawdown 15 years | |
|---|---|---|---|---|---|---|
| | | | TOP 10% | LOW 10% | TOP 10% | LOW 10% |
| CAPE | 21.0 | 30.9% | 13.3% | 0.5% | -4.0% | -44.1% |
| CAPE_adj | 23.8 | 26.5% | 12.5% | 0.1% | -4.0% | -44.4% |
| PB | 2.0 | 12.6% | 13.6% | 0.5% | -3.5% | -42.3% |
| PE | 21.3 | 38.1% | 12.4% | 2.6% | -7.7% | -31.3% |
| PC | 8.9 | 24.4% | 13.2% | 2.1% | -4.5% | -39.1% |
| DY | 3.2 | 31.2% | 13.1% | 1.1% | -4.2% | -38.5% |

Figure 15: The table shows the average valuations ("Average") of all evaluated indicators of the 17 MSCI indexes for the period 12/1979-05/2015. "Rel. stand. deviation" corresponds to the relative standard deviation of the averages of the 17 countries for this period. For the most favourable 10% of all observations ("TOP 10%") the average returns of the following 10-15 years ("Ø Performance 10-15 years") and the average maximum "Ø Drawdown 15 years" over the following 15 years are given for each indicator, as well for the least attractively valued 10% of all observations ("LOW 10%"). All returns are adjusted for inflation, in local currency and incl. dividend income. Source: MSCI and own calculations.

## Relationship (R²) between valuation indicators and subsequent returns

| R² | CAPE | CAPE_adj | PB | PE | PC | DY |
|---|---|---|---|---|---|---|
| Australia | 0.85 | 0.84 | 0.86 | 0.28 | 0.54 | 0.43 |
| Belgium | 0.67 | 0.56 | 0.85 | 0.78 | 0.90 | 0.92 |
| Canada | 0.01 | 0.01 | 0.10 | 0.15 | 0.01 | 0.02 |
| Denmark | 0.23 | 0.26 | 0.35 | 0.06 | 0.47 | 0.23 |
| France | 0.69 | 0.64 | 0.72 | 0.11 | 0.88 | 0.70 |
| Germany | 0.85 | 0.85 | 0.76 | 0.41 | 0.82 | 0.70 |
| Hong Kong | 0.90 | 0.89 | 0.90 | 0.35 | 0.31 | 0.83 |
| Italy | 0.98 | 0.99 | 0.95 | 0.14 | 0.85 | 0.22 |
| Japan | 0.90 | 0.87 | 0.34 | 0.41 | 0.82 | 0.94 |
| Netherlands | 0.90 | 0.90 | 0.93 | 0.79 | 0.90 | 0.87 |
| Norway | 0.30 | 0.31 | 0.54 | 0.01 | 0.21 | 0.20 |
| Singapore | 0.72 | 0.68 | 0.62 | 0.06 | 0.03 | 0.66 |
| Spain | 0.99 | 0.98 | 0.88 | 0.35 | 0.87 | 0.91 |
| Sweden | 0.78 | 0.79 | 0.76 | 0.48 | 0.65 | 0.53 |
| Switzerland | 0.58 | 0.58 | 0.68 | 0.60 | 0.63 | 0.62 |
| UK | 0.86 | 0.82 | 0.94 | 0.71 | 0.85 | 0.72 |
| USA | 0.83 | 0.81 | 0.86 | 0.61 | 0.82 | 0.84 |
| S&P 500 since 1979 | 0.82 | 0.80 | - | 0.60 | - | 0.85 |
| S&P 500 since 1881 | 0.46 | 0.43 | - | 0.33 | - | 0.27 |
| MSCI Countries | 0.58 | 0.56 | 0.55 | 0.33 | 0.45 | 0.45 |
| All Countries | 0.49 | 0.48 | - | 0.28 | - | 0.30 |

Figure 16: The table shows the coefficients of determination ("R²") for the relationship between the indicators listed and the average returns of the following 10-15 years for each. All returns are adjusted for inflation, in local currency and incl. dividend income. The analysis of the individual countries covers the period 12/1979 to 05/2015. (Source: MSCI, own calculations). For the US, S&P 500 data from 01/1881 to 05/2015 was used (Source: Shiller [2015], own calculations). The grey rows "USA" (MSCI USA), "S&P 500 since 1979" (S&P 500 since 1979 based on data from Shiller) and "MSCI Countries" (only MSCI Countries) are for informational purposes only and not incorporated in "All Countries". As data for PB and PC is unavailable for the S&P 500, there are no values for "All Countries".

in favour of a more comparable and stable relationship internationally.

Again, R² shows a high degree of consensus between the three indicators (Figure 16). With an R² of approximately 0.5 and a correlation of just under -0.7, the strength of the relationship among these indicators and the subsequent long-term returns on the stock markets is comparable to the relationship between the annual returns of the DAX and the S&P 500 for the period 1973-2015 (R² 0.47, correlation 0.68). A further comparison: for the period 1881-2015, the earnings growth in the S&P 500 and the returns over the subsequent 15 years showed a much lower correlation (R² 0.13, correlation 0.37). Hence, CAPE and PB enable more reliable long-term forecasts than correctly estimated long-term earnings growth rates.

Consistent with the expectations, the link among other indicators, especially PE and PC, and future returns are much weaker than that of CAPE or PB (see Appendix 2-4). These indicators did indeed also show high subsequent returns and lower setbacks following low valuations, but the relationship was less significant. As such, besides "All Countries" and "MSCI Countries", also in 14 out of 17 individual countries are the PE coefficients of determination (R²) substantially lower than those of CAPE. DY and PC performed poorly in comparison to CAPE both in 11 and 13 individual countries respectively as well as in all groups of countries. Moreover, both indicators also did worse than PB in 12 and 13 countries respectively.

Hence, long-term stock market performance can be best determined using CAPE and PB. Furthermore, taking both factors into consideration — rather than relying solely on CAPE-based return estimates — has the theoretical advantage that both the earnings and the net asset value of a market are included in the valuation.

# 4

## Current return estimates based on CAPE and PB

In the following, return estimates for 17 MSCI Investable Market Indexes (IMI)[10], the S&P 500 and four MSCI regions are calculated using the findings gathered so far. This is based on the relationship derived from "All Countries" between the valuation and the subsequent long-term returns in each of the largest available data samples. At first, the expected return for the next 10 to 15 years is estimated using regression functions, although Denmark's data is not included in the regression analysis due to considerable structural breaks in recent decades.

## What returns can investors expect in the long-term?

| Country | CAPE as of 31/12/2015 | Perf. forecast 10-15 years (CAPE) | PB as of 31/12/2015 | Perf. forecast 10-15 years (PB) | Average forecast |
|---|---|---|---|---|---|
| Australia | 15.5 | 7.7% | 1.7 | 7.5% | 7.6% |
| Belgium | 21.0 | 5.6% | 2.3 | 5.5% | 5.5% |
| Canada | 17.1 | 7.0% | 1.6 | 8.2% | 7.6% |
| Denmark | 40.1 | 1.0% | 3.8 | 2.2% | 1.6% |
| France | 16.6 | 7.2% | 1.5 | 8.4% | 7.8% |
| Germany | 18.2 | 6.6% | 1.8 | 7.4% | 7.0% |
| Hong Kong | 14.9 | 8.0% | 1.2 | 10.3% | 9.2% |
| Italy | 12.7 | 9.1% | 1.1 | 10.6% | 9.9% |
| Japan | 26.2 | 4.0% | 1.3 | 9.4% | 6.7% |
| Netherlands | 18.3 | 6.5% | 2.1 | 6.3% | 6.4% |
| Norway | 11.7 | 9.7% | 1.2 | 9.9% | 9.8% |
| Singapore | 11.5 | 9.9% | 1.1 | 10.6% | 10.2% |
| Spain | 11.3 | 9.9% | 1.3 | 9.4% | 9.7% |
| Sweden | 19.8 | 6.0% | 2.2 | 5.8% | 5.9% |
| Switzerland | 22.5 | 5.1% | 2.6 | 4.9% | 5.0% |
| UK | 12.7 | 9.1% | 1.8 | 7.3% | 8.2% |
| USA | 24.6 | 4.4% | 2.7 | 4.6% | 4.5% |
| S&P 500 | 25.9 | 4.1% | 2.8 | 4.3% | 4.2% |
| World AC | 19.5 | 6.1% | 2.0 | 6.6% | 6.3% |
| Developed Markets | 20.5 | 5.7% | 2.1 | 6.2% | 6.0% |
| Europe | 15.5 | 7.7% | 1.8 | 7.3% | 7.5% |
| Emerging Markets | 13.5 | 8.7% | 1.4 | 9.1% | 8.9% |

Figure 17: This table shows the valuations of the chosen MSCI Investable Market Indexes as of 31/12/2015, as well as the resultant estimates for real stock market returns in the coming 10-15 years in local currency and incl. dividends. The CAPE regression function (-0.071*ln(CAPE)+0.2718) is based on the findings of "All Countries" for the period 01/1881-05/2015 (S&P 500) and for 12/1979-05/2015 (other MSCI countries), excluding Denmark. The regression function for PB (-0.069*ln(PB)+0.1135) is based on the findings of "MSCI Countries", including out-of-sample data for the period 12/1974-05/2015, excluding Denmark. In contrary to the empirical analysis, the current forecasts are based on the MSCI IMI due to broader and more representative market coverage (see Endnote no. 10). The CAPE stems from Shiller [2015], whereas the EPS data of the S&P 500 in the time frame 07/2015-12/2015 is complemented using estimates from Standard and Poors [2015]. Information regarding regions is based on regional MSCI IMI indexes. For example, "World AC" corresponds to MSCI All Country Investable Market Index. Source for the PB in the S&P 500 as of 31/12/2015 is Bloomberg.

## Which distribution of returns followed on comparable valuations over 15 years?

| | Subsequent returns using CAPE | | | | | Subsequent returns using PB | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Country | Max | 75% | Median | 25% | Min | Max | 75% | Median | 25% | Min |
| Australia | 22.1% | 9.1% | 7.1% | 5.7% | -0.1% | 18.2% | 8.6% | 6.8% | 5.2% | -2.1% |
| Belgium | 14.5% | 7.1% | 5.4% | 3.0% | -2.1% | 14.1% | 7.6% | 5.0% | 2.9% | -3.8% |
| Canada | 18.2% | 7.9% | 6.4% | 4.8% | -1.5% | 19.0% | 9.5% | 7.3% | 5.7% | -0.9% |
| Denmark | 6.7% | 2.4% | 0.9% | -2.2% | -6.4% | 10.2% | 3.1% | 2.0% | 0.4% | -6.4% |
| France | 18.2% | 7.9% | 6.4% | 4.8% | -1.5% | 22.1% | 10.0% | 7.8% | 6.4% | 0.3% |
| Germany | 17.5% | 7.7% | 6.1% | 4.4% | -2.1% | 16.6% | 8.3% | 6.6% | 5.2% | -2.6% |
| Hong Kong | 22.1% | 9.1% | 7.1% | 5.7% | -0.1% | 22.0% | 11.6% | 9.4% | 8.0% | 1.2% |
| Italy | 22.0% | 10.9% | 8.3% | 6.5% | 1.2% | 18.2% | 12.3% | 10.0% | 8.4% | 3.4% |
| Japan | 11.0% | 6.1% | 4.1% | 2.4% | -1.5% | 22.1% | 10.4% | 8.9% | 7.4% | 1.2% |
| Netherlands | 17.5% | 7.7% | 6.1% | 4.4% | -2.1% | 15.0% | 8.0% | 5.9% | 4.2% | -3.8% |
| Norway | 22.0% | 12.2% | 10.0% | 7.3% | 2.0% | 22.0% | 11.6% | 9.4% | 8.0% | 1.2% |
| Singapore | 18.3% | 12.9% | 10.4% | 7.9% | 2.9% | 18.2% | 12.3% | 10.0% | 8.4% | 3.4% |
| Spain | 18.3% | 12.9% | 10.4% | 7.9% | 2.9% | 22.1% | 10.4% | 8.9% | 7.4% | 1.2% |
| Sweden | 15.0% | 7.4% | 5.4% | 3.2% | -2.1% | 14.4% | 7.7% | 5.4% | 3.3% | -3.8% |
| Switzerland | 14.4% | 6.8% | 5.0% | 2.5% | -2.0% | 10.8% | 6.2% | 4.2% | 2.6% | -3.1% |
| UK | 22.0% | 10.9% | 8.3% | 6.5% | 1.2% | 16.6% | 8.3% | 6.6% | 5.2% | -2.6% |
| USA | 12.5% | 6.4% | 4.3% | 2.4% | -1.5% | 10.6% | 5.9% | 4.1% | 2.4% | -2.3% |
| S&P 500 | 11.0% | 6.1% | 4.1% | 2.4% | -1.5% | 10.5% | 5.5% | 3.8% | 1.9% | -3.4% |
| World AC | 16.6% | 7.6% | 5.8% | 4.0% | -2.1% | 15.1% | 8.1% | 6.2% | 4.7% | -3.3% |
| Developed Markets | 15.0% | 7.4% | 5.4% | 3.2% | -2.1% | 15.0% | 8.0% | 5.9% | 4.2% | -3.8% |
| Europe | 22.1% | 9.1% | 7.1% | 5.7% | -0.1% | 16.6% | 8.3% | 6.6% | 5.2% | -2.6% |
| Emerging Markets | 22.1% | 9.8% | 7.7% | 6.0% | 0.3% | 22.1% | 10.2% | 8.4% | 6.8% | 1.2% |

Figure 18: Based on comparable valuations, the table shows the subsequent real returns over 15 years in local currency incl. dividends and based on current CAPE (left) and PB (right). For example: The Australian stock market had a CAPE of 15.5 on 31/12/2015. The comparable valuation interval to a CAPE of 15 (rounded-up to 0 decimal places) plus or minus 10% corresponds to a CAPE range of 13.5-16.5. In "All Countries" (S&P 500 since 01/1881, other countries not including Denmark since 12/1979) market phases with a CAPE within these intervals were followed by, at best, yearly returns of 22.1% ("Max") over the following 15 years. The "Median" of all the observed returns was 7.1% and the majority of observations were between 5.7% and 9.1% ("25%" and "75%" quartiles respectively). The PB calculations follow the same pattern. In contrast to CAPE, the PB interval was rounded up to one decimal place and the subsequent returns were determined using "MSCI Countries", incl. out-of-sample data excluding Denmark since 12/1974. For example: the Australian PB of 1.7 led to a comparable PB interval of 1.53-1.87. In the MSCI Countries since 12/1974, there were annual losses of, at worst, -2.1% over the following 15 years.

According to Figure 17, the CAPE-based return forecasts are on average about 10% lower than those of PB. This is because the PB return forecast is completely based on the more recent period 1974-2015, which was characterised by higher valuations. Despite these differences, in half of the countries the return forecasts of CAPE and PB differ by less than 10%. E.g. CAPE and PB forecast returns of 4.1% and 4.3% respectively for the S&P 500. As long as both earnings and book value based valuations lead to such similar return forecasts, the predictions seem far more reliable than in cases with high deviations, such as Japan. Depending on whether CAPE or PB is used, long-term return forecasts for the Japanese market range from 4.0% to 9.4%. Such differences may mean that projections for this market are subject to a higher degree of uncertainty.

Besides forecasting returns using a regression function, from an investor's point of view, it is also interesting to take past market phases with comparable valuations to today's markets and see what their historical returns were. For this purpose, each stock market is assigned a past CAPE or PB interval that is comparable to its current valuation, and the historical distribution of stock returns for the subsequent 15 years is determined using the maximum available data sample.

As of 31/12/2015, the S&P 500's CAPE is 25.9. In the past, periods with comparable valuations were followed by average global returns of 4.1% p.a. over the subsequent 15 years[12]. The majority of 15-year periods showed returns of 2.4% to 6.1%. Likewise for the PB of 2.8 similar average global returns of 3.8%

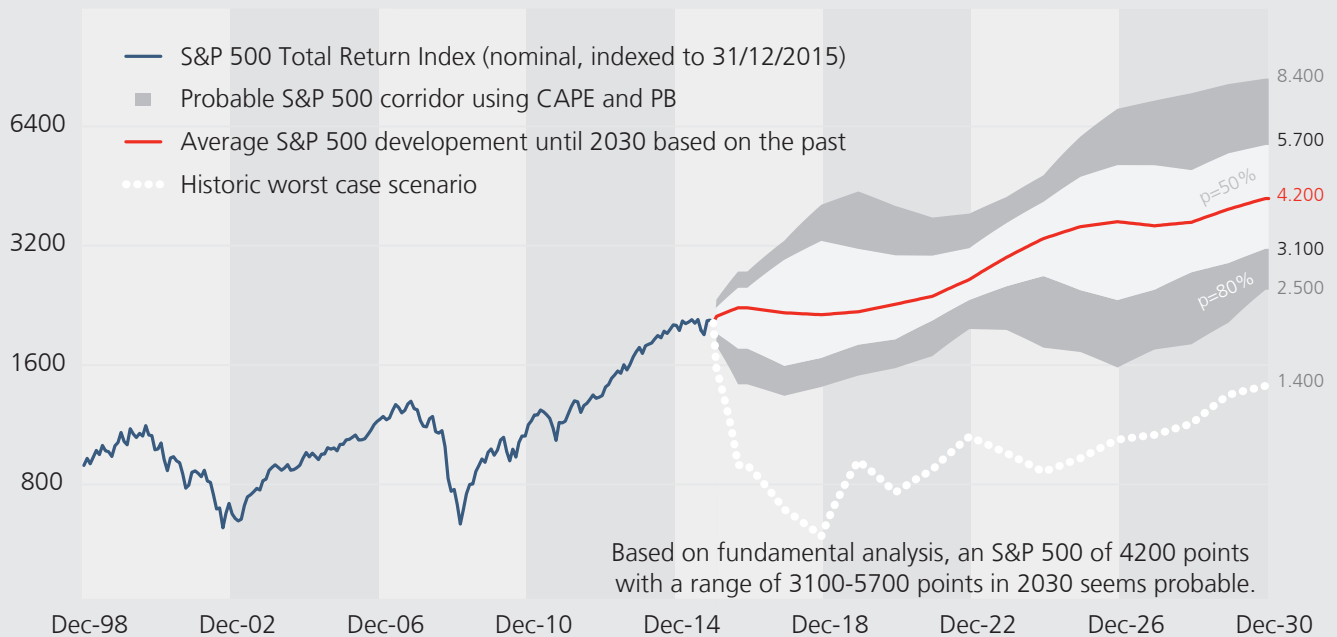## Scenario analysis for the S&P 500 Index until 2030



Figure 19: This chart shows the nominal S&P 500 since 12/1998, adjusted for inflation. As of 31/12/2015, the S&P 500 has a CAPE of 25.9 and a PB of 2.8. The diagram shows the average subsequent returns (which followed a comparable valuation worldwide) over 1 to 15 years. The calculation of comparable intervals matches the procedure from Figure 18 (+/- 10%, CAPE interval is 23.4-28.6, for PB 2.5-3.1), whereas the corridor is calculated using the absolute highest return (For example: The lowest measured 15 years return on a valuation comparable to the current US-market corresponds to -1.4% and -3.4% for the CAPE and PB respectively. Therefore, the more conservative -3.4% was used.). The light grey corridor (p=50%) reflects 50% of all observed values, the dark grey 80%. The worst case scenario corresponds to the lowest subsequent return measured for a comparable value. The average S&P 500 development (red) shows the average of the average subsequent returns using CAPE and PB. All calculations assumed an inflation rate of 1% and reinvestment of dividends.

followed after 1974, connected with a range of 1.9% to 5.5% (Figure 18). Thus, based on CAPE and PB, expected returns of 1.9% to 6.1% over the next 15 years are seen to be realistic for the S&P 500. Assuming a persistent relation, a conservative inflation rate of 1 percent and a reinvestment of dividends, this would correspond to a probable S&P 500 range of 3,100-5,700 points in 2030. However, the predicted performance is achieved not through stable market conditions but fluctuations. These different forms of mean reversion can be described in terms of scenario analyses. Figure 19 shows the course taken by past equity markets with comparable valuations over the following 1 to 15 years.

The scenario corridor shown here does not just permit statements about long-term return potential, it also provides information about the medium-term opportunities and risks as well as the limits of fundamental valuation. By removing outliers (upper and lower 10% of the observation periods), it is clear to see that the S&P 500 can register both a fall to 1,300 points

(-35% from the current price level) and rise to 4,100 points (+100%) over a period of three years. From a historical point of view, the most likely S&P 500 future performance is depicted in the grey area in Figure 19.

The worst case scenario, with a correction potential to 600 points in three years, corresponds to the lowest-given subsequent return on a comparable valuation since 1881. Although the occurrence of this scenario — based on negative outliers — is unlikely, it gives a rough indication of the impact that extreme events, such as world wars or severe depressions (as in 1929), had on equity markets in the past. Since a level of 6,900 points for the S&P 500 would be just as (un)likely, the "best case" scenario is not shown in the Figure above due to the outlier characteristic.

# 5

## Conclusion

Existing research indicates that the cyclically adjusted Shiller CAPE has predicted long-term returns in the S&P 500 since 1881 fairly reliable for periods of more than 10 years. Furthermore, the results of this paper indicate that this was also the case for 16 other international equity markets in the period from 1979 to 2015, and in addition to this, CAPE also enabled equity market risks to be gauged. In this manner, low market valuations were not only followed by above average market returns but also lower drawdowns. On the contrary, high market valuations led to lower returns and faced higher market risks.

Since CAPE sets the market price in relation to the average index earnings of the last 10 years, and thus assumes a mean reversion of earnings, it can be assumed that the indicator's ability to predict decreases in the face of increasing structural changes within the countries' index structure. Indeed, evidence of this was found that small-sized markets with major structural changes or markets in which earnings growth deviates significantly from the S&P 500 tend to show weaker relationships. Investors should therefore question CAPE-based forecasts

in these markets and in case of doubt switch to other valuation criteria. In this manner, the price-to-book ratio is a particularly relevant alternative, as the more stable book values do not require 10-year smoothing and render the (not unproblematic) assumption of a comparable market structure over the preceding 10 years redundant[11]. The results of this research do not just support these findings in theory. Empirically, PB has enabled both returns and risk to be forecasted since 1979 with accuracy comparable to CAPE. It is hardly surprising that an indicator, which is frequently used as a value proxy at the stock level, also correlates to future returns at market level. It seems likely that the only reason the price-to-book ratio is not used more frequently in practice is because of missing data and the resulting inability to verify it empirically.

There are several reasons why a combination of various indicators would be advisable. Simultaneous consideration of both earnings and the net asset value components is especially beneficial since one indicator assumes a constant market structure over the previous 10 years and includes pre-war years, and the other indicator does not assume a constant market structure and considers the more recent, and possibly, more comparable past.

In addition to the CAPE and PB indicators, price-to-earnings ratio (PE) and price-to-cash-flow ratio (PC) generally showed a weaker relationship with future returns. It can be assumed that the ability of PE and PC to reliably forecast is partially affected by the high volatility of earnings and cash flows. Moreover, shrinking earnings and cash flows make markets appear unattractive, especially in crisis periods which are lucrative from an investor's perspective. Dividend yields, too, only allowed far less reliable return forecasts in the past. This could be due to a general decline in dividends, which prevented a fair average and the mean reversion, thus weakening its forecast quality. The CAPE adjusted for changes in payout ratios (CAPE_adj) did not improve the predictive power of CAPE either — neither in the S&P 500 since 1881 nor in the MSCI Country universe since 1979.

Based on the findings, the long-term equity market potential for various markets was determined using CAPE and price-to-book ratios. Due to the current valuation as of 31st December 2015, investors with a global portfolio can probably achieve real returns of 6.3% over the next 10 to 15 years. Even greater gains can be expected in European equity markets (7.5%) and in the emerging markets (8.9%). On a country level, Singapore (10.2%), Italy (9.9%) and Norway (9.8%) provide the highest long-term return potential.

Leaving out Denmark, the lowest return potential in the long-run is predicted for both the S&P 500 as well as the broader MSCI USA Investable Market Index. Due to the high valuation of the US stock market, investors can only expect below-average returns of 4.2-4.5% associated with a higher drawdown potential.

As stock market returns are subject to high fluctuations, the S&P 500 was analysed to find out which returns of the last few decades followed a valuation comparable to today. This scenario analysis makes an S&P 500 of 3,100 to 5,700 points in 2030 seem probable. However, it becomes evident that basic forecasts are subject to uncertainty in the short term. Based on historical experience, S&P 500 levels of 1,300 to 4,100 would be conceivable over a period of 3 years.

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## Endnotes

[1]See Siegel [2014] and Dimson, Staunton, Wilmot, McGinnie [2012] for the returns of various asset classes.

[2]For example, see Fama, French [1992], Lakonishok, Shleifer, Vishny [1994], Asness, Moskowitz, Pedersen [2013].

[3]Cole, Helwege, Laster [1996] came to similar results for price-to-earnings ratio, price-to-book ratio and dividend yields for the S&P 500 in the period 1927-1994.

[4]See Malkiel [2015] and Shiller [2000].

[5]The performance indicators take dividend yields into account analogous to Trevino and Robertson [2002]. This stands in contrast to Campbell and Shiller [1988, 1998, 2001], who examined the correlation based on price data.

[6]For further information regarding NIPA earnings, see Hodge [2011] and Mead, Moulton, Petrick [2004].

[7]Philosophical Economics [2014b] debates the influence of structural changes using the example of Irish ISEQ 20.

[8]Negative indicators occurred in only 53 out of 4889 observation months (1.1%) for the PE ratio in Denmark, Norway, Italy and Sweden. No remarkable long-term subsequent returns were observed, therefore, these values haven't been evaluated separately.

[9]The disadvantages of point-to-point predictions related to long-term return forecasts are discussed in detail by Philosophical Economics [2014a].

[10]The MSCI Investable Market Indexes (IMI) include small-cap securities, in contrast to conventional MSCI indexes, and target to cover 99% of the market's free-float adjusted market capitalization. Consequently, the IMI are more representative and model the investable security universe more pre-

cisely. This fact makes these indexes less vulnerable to structural changes, especially in smaller countries, which can be seen in Figure 3 for Greece. As IMI EPS data is only available since 1994, the empirical analysis is based on the standard MSCI indexes. Due to the fact that only relatively large markets, in which the correlation between the MSCI and MSCI IMI Index is very high, were examined in this analysis, we assume that the relation is transferable.

[11]The relation derived from the PB ratio may not be skewed by a change in the index structure in the previous 10 years, but — as all other indicators — the PB does not take the differences of valuation between countries resulting from divergent sector structures into account. E.g. as of 31/12/2015, MSCI Denmark is invested 53.5% in the Healthcare sector, whereas MSCI World consists of only 13.5%. Considering the fact that the average PB ratio of the supranational MSCI World Health Care Index (4.6) provides a 90% valuation premium over the MSCI World (2.4) since data recording has started in 1995, it is questionable if the MSCI Denmark with its high dependency on the Healthcare sector can revert to an ordinary valuation level. These sector differences can be taken into account using a sector adjustment (e.g. http://starcapital.de/download/?file=Research_2015-09_ Sector_Adjusted_Country_Valuation_DK.pdf) in order to increase the international comparability of fundamental indicators.

[12]In contrast to the previous analysis, Figure 18 does not show the average returns over the subsequent 10-15 years but 15 years as this is necessary for the following scenario analysis.

# 7

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## Relationship between CAPE_adj and average real returns of the subsequent 10-15 years (p.a.)

| Country | # | R² | Cor | 0-10 Min/25% | Med | Max/75% | # | 10-15 Min/25% | Med | Max/75% | # | 15-20 Min/25% | Med | Max/75% | # | 20-25 Min/25% | Med | Max/75% | # | 25-30 Min/25% | Med | Max/75% | # | >=30 Min/25% | Med | Max/75% | # | R² Δ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Australia | 246 | 0.84 | -0.91 | 12%/12% | 12.4% | 13%/13% | 6 | 8%/10% | 10.1% | 13%/11% | 43 | 5%/7% | 7.9% | 10%/9% | 105 | 5%/6% | 7.0% | 8%/8% | 70 | 4%/5% | 4.9% | 6%/5% | 20 | 4%/4% | 3.8% | 4%/4% | 2 | 0.00 |
| Belgium | 246 | 0.56 | -0.76 | 18%/18% | 18.2% | 19%/19% | 7 | 10%/10% | 16.2% | 17%/17% | 34 | 4%/8% | 8.8% | 16%/15% | 98 | 0%/4% | 7.5% | 15%/13% | 29 | -1%/3% | 8.4% | 13%/11% | 54 | -4%/-3% | -2.9% | 10%/-2% | 24 | -0.01 |
| Canada | 246 | 0.01 | -0.22 | 7%/7% | 7.8% | 9%/8% | 10 | 3%/6% | 6.3% | 8%/7% | 44 | 1%/7% | 8.2% | 10%/9% | 101 | 6%/4% | 9.7% | 10%/9% | 30 | 7%/9% | 8.9% | 10%/9% | 19 | 2%/5% | 5.6% | 8%/6% | 42 | -0.02 |
| Denmark | 246 | 0.26 | -0.51 | 8%/9% | 9.4% | 14%/13% | 39 | 6%/9% | 10.1% | 14%/12% | 60 | 5%/7% | 8.7% | 10%/10% | 30 | 7%/7% | 7.6% | 11%/8% | 35 | 10%/10% | 11.0% | 12%/11% | 13 | 4%/6% | 7.1% | 12%/11% | 69 | -0.04 |
| France | 225 | 0.64 | -0.83 | 13%/14% | 14.1% | 15%/14% | 18 | 12%/13% | 13.0% | 14%/13% | 10 | 8%/8% | 8.8% | 15%/12% | 53 | 6%/7% | 7.8% | 14%/11% | 63 | 3%/5% | 8.4% | 11%/10% | 31 | -2%/0% | 1.4% | 10%/10% | 50 | 0.00 |
| Germany | 246 | 0.85 | -0.94 | 10%/11% | 10.7% | 11%/11% | 15 | 9%/9% | 9.9% | 13%/10% | 50 | 6%/7% | 7.7% | 12%/9% | 67 | 5%/6% | 7.0% | 10%/8% | 59 | 5%/5% | 6. % | 8%/7% | 15 | -%/0% | 0.7% | 4%/2% | 40 | 0.01 |
| Hong Kong | 116 | 0.89 | -0.92 |  |  |  |  | 9%/9% | 9.8% | 12%/10% | 9 | 7%/7% | 7.7% | 9%/8% | 25 | 5%/6% | 6.2% | 7%/6% | 51 | 4%/5% | 5.0% | 6%/6% | 26 | 3%/3% | 4.0% | 5%/4% | 5 | 0.00 |
| Italy | 74 | 0.99 | -0.98 |  |  |  |  |  |  |  |  | 6%/7% | 6.9% | 7%/7% | 2 | 4%/6% | 6.2% | 7%/7% | 33 | 1%/2% | 3.1% | 5%/4% | 6 | -5%/-3% | -2.9% | 2%/-2% | 33 | 0.01 |
| Japan | 246 | 0.87 | -0.87 |  |  |  |  |  |  |  |  | 9%/9% | 10.0% | 10%/10% | 14 | 7%/7% | 7.8% | 9%/8% | 26 | 1%/6% | 6.2% | 7%/7% | 11 | -7%/-3% | -1.2% | 5%/-3% | 195 | 0.07 |
| Netherlands | 246 | 0.90 | -0.95 | 14%/15% | 15.8% | 18%/17% | 42 | 8%/10% | 13.9% | 17%/15% | 103 | 6%/7% | 7.3% | 14%/8% | 45 | 4%/4% | 4.8% | 6%/5% | 13 | 2%/2% | 2.5% | 3%/3% | 5 | -2%/-2% | -1.2% | 1%/-1% | 38 | 0.03 |
| Norway | 246 | 0.31 | -0.51 | 11%/11% | 11.8% | 13%/12% | 11 | 5%/6% | 8.2% | 11%/9% | 71 | 2%/5% | 7.0% | 10%/8% | 99 | 2%/6% | 7.5% | 9%/6% | 45 | 4%/5% | 5.0% | 7%/6% | 17 | 4%/4% | 4.6% | 5%/5% | 3 | -0.01 |
| Singapore | 210 | 0.68 | -0.82 |  |  |  |  | 7%/8% | 8.1% | 10%/9% | 6 | 5%/6% | 6.5% | 10%/9% | 19 | 3%/3% | 6.0% | 8%/4% | 37 | 2%/3% | 3.9% | 7%/4% | 70 | 1%/2% | 2.7% | 6%/3% | 78 | 0.01 |
| Spain | 125 | 0.98 | -0.99 |  |  |  |  | 12%/13% | 12.8% | 14%/13% | 19 | 10%/10% | 10.9% | 12%/12% | 57 | 7%/8% | 9.3% | 10%/10% | 11 | 4%/5% | 5.1% | 6%/5% | 7 | -1%/0% | 0.9% | 4%/2% | 31 | 0.01 |
| Sweden | 246 | 0.79 | -0.93 | 16%/17% | 18.7% | 20%/19% | 20 | 14%/15% | 15.7% | 17%/17% | 21 | 10%/14% | 14.4% | 16%/16% | 50 | 10%/12% | 13.4% | 15%/15% | 51 | 11%/11% | 12.0% | 15%/13% | 52 | -1%/4% | 5.3% | 11%/7% | 52 | -0.04 |
| Switzerland | 246 | 0.58 | -0.88 | 7%/8% | 9.6% | 13%/11% | 36 | 12%/12% | 12.7% | 15%/13% | 35 | 11%/11% | 12.0% | 15%/13% | 66 | 9%/9% | 10.4% | 12%/10% | 47 | 7%/8% | 7.8% | 9%/8% | 14 | -1%/1% | 1.4% | 7%/3% | 48 | 0.00 |
| UK | 246 | 0.82 | -0.93 | 12%/12% | 12.8% | 14%/13% | 31 | 9%/11% | 11.8% | 13%/12% | 31 | 6%/6% | 7.5% | 11%/9% | 105 | 2%/4% | 4.8% | 9%/6% | 47 | 0%/1% | 0.8% | 7%/1% | 30 | 0%/0% | 0.2% | 0%/0% | 2 | 0.01 |
| USA | 246 | 0.81 | -0.95 | 11%/12% | 12.4% | 14%/13% | 16 | 9%/11% | 11.7% | 14%/13% | 56 | 9%/11% | 12.1% | 14%/13% | 53 | 6%/8% | 7.9% | 11%/8% | 60 | 4%/4% | 4.6% | 6%/5% | 17 | -1%/-1% | -0.2% | 4%/1% | 44 | - |
| S&P s. 1979 | 246 | 0.80 | -0.95 | 11%/12% | 12.5% | 14%/13% | 16 | 9%/11% | 11.6% | 14%/13% | 58 | 10%/11% | 12.1% | 13%/12% | 40 | 7%/8% | 7.8% | 11%/9% | 69 | 4%/4% | 4.8% | 7%/6% | 19 | -1%/-1% | -0.1% | 4%/1% | 44 | - |
| S&P s. 1881 | 1433 | 0.43 | -0.65 | 11%/11% | 11.4% | 14%/12% | 75 | 1%/8% | 10.1% | 16%/13% | 310 | -1%/4% | 6.8% | 14%/10% | 420 | -2%/3% | 6.1% | 11%/7% | 439 | -2%/-1% | 1.8% | 7%/4% | 131 | -2%/-1% | -0.3% | 4%/1% | 58 | -0.07 |
| MSCI Count. | 3702 | 0.56 | -0.75 | 7%/11% | 12.7% | 20%/15% | 251 | 3%/9% | 11.0% | 17%/13% | 592 | 1%/7% | 8.6% | 18%/11% | 989 | 0%/6% | 7.5% | 16%/9% | 707 | -1%/4% | 5.5% | 15%/9% | 407 | -7%/-1% | 1.1% | 12%/4% | 756 | - |
| All Countries | 4889 | 0.48 | -0.68 | 7%/11% | 12.1% | 20%/14% | 310 | 1%/9% | 10.5% | 17%/13% | 846 | -1%/7% | 8.1% | 18%/11% | 1356 | -2%/5% | 6.9% | 16%/8% | 1086 | -2%/2% | 4.8% | 15%/8% | 521 | -7%/-1% | 1.0% | 12%/4% | 770 | - |

Figure 20: The table shows the average returns (median, "Med") of the subsequent 10-15 years in relation to CAPE_adj by country as well as the statistical relationship by reference to "R²" and the correlation ("Cor"). All returns are given in local currency, incl. dividend income, annualised and adjusted for inflation using local CPI price indexes (Source: Datastream). The analysis of individual countries covers the period 12/1979 to 05/2015, provided that the necessary fundamental and performance data was available (Source: MSCI, own calculations). For the US, S&P 500 data since 01/1881 was also used (Source: Shiller [2015], own calculations). The last performance period taken into account is the period 05/2000-05/2015. The "All Countries" row takes all 4889 observations months into account ("#"). The "Min" and "Max" columns show the minimum and maximum, or rather the "25%"/ "75%" quartiles observed in each country. The "USA" (MSCI USA), "S&P s. 1979" (S&P 500 since 1979 based on data from Shiller) and "MSCI Count." (only MSCI Countries) rows, in grey, are for information purposes only and not incorporated in "All Countries". The "R² Δ" column indicates the extent to which the "All Countries" R² changes without the inclusion of the respective country.

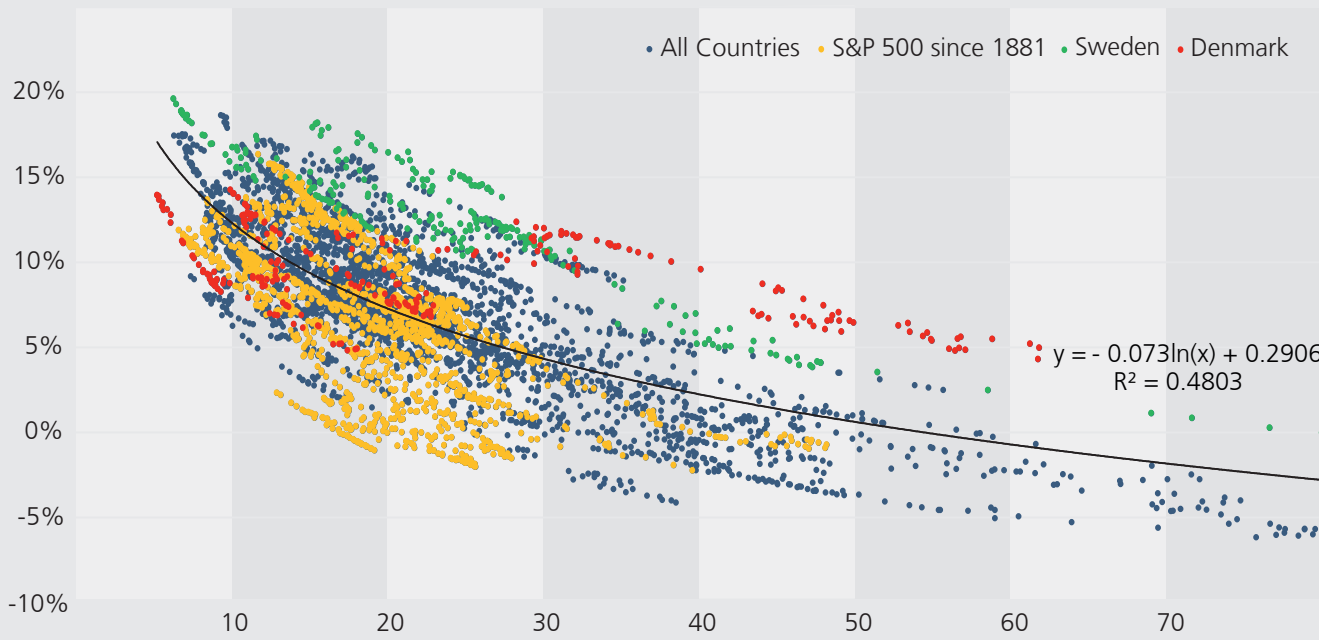## Relationship between CAPE_adj and average real returns of the subsequent 10-15 years (p.a.)



Figure 21: The chart shows the relationship between CAPE_adj and the returns of the subsequent 10-15 years for the periods 01/1881-05/2015 (S&P 500) and 12/1979-05/2015 (other MSCI Countries). The three countries that had the highest absolute effect in terms of "R² Δ", as well as Japan, are highlighted as examples. All returns are adjusted for inflation, in local currency, incl. dividend income and annualised. The regression function applies to "All Countries". Source: S&P 500: Shiller [2015], other countries: MSCI and own calculations.

$$y = -0.073\ln(x) + 0.2906$$
$$R^2 = 0.4803$$

## Relationship between PE and average real returns of the subsequent 10-15 years (p.a.)

| Country | # | R² | Cor | 0-10 Min/25% | 0-10 Med | 0-10 Max/75% | 0-10 # | 10-15 Min/25% | 10-15 Med | 10-15 Max/75% | 10-15 # | 15-20 Min/25% | 15-20 Med | 15-20 Max/75% | 15-20 # | 20-25 Min/25% | 20-25 Med | 20-25 Max/75% | 20-25 # | 25-30 Min/25% | 25-30 Med | 25-30 Max/75% | 25-30 # | ≥30 Min/25% | ≥30 Med | ≥30 Max/75% | ≥30 # | R² Δ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Australia | 246 | 0.28 | -0.52 | 7%/8% | 9.8% | 12%/11% | 17 | 5%/7% | 8.2% | 13%/10% | 120 | 4%/6% | 7.5% | 9%/8% | 78 | 4%/5% | 5.4% | 9%/9% | 31 | | | | | | | | | 0.00 |
| Belgium | 246 | 0.78 | -0.87 | 9%/15% | 15.7% | 19%/16% | 68 | 5%/6% | 9.0% | 19%/12% | 102 | -3%/0% | 3.9% | 17%/8% | 51 | -4%/-4% | -2.7% | 8%/5% | 22 | -4%/-4% | -4.0% | -4%/-4% | 3 | | | | | 0.01 |
| Canada | 246 | 0.15 | 0.36 | 1%/3% | 3.2% | 9%/6% | 31 | 3%/8% | 8.0% | 9%/8% | 42 | 6%/7% | 8.2% | 10%/9% | 58 | 5%/5% | 6.7% | 10%/7% | 43 | 3%/5% | 5.7% | 10%/7% | 25 | 2%/6% | 9.5% | 10%/10% | 47 | -0.03 |
| Denmark | 226 | 0.06 | -0.12 | 6%/9% | 9.8% | 14%/12% | 54 | 6%/7% | 8.7% | 13%/9% | 36 | 5%/8% | 10.2% | 13%/11% | 52 | 6%/7% | 7.8% | 14%/11% | 39 | 5%/5% | 6.6% | 14%/13% | 25 | 4%/7% | 7.8% | 12%/9% | 20 | -0.03 |
| France | 225 | 0.11 | -0.05 | 9%/12% | 13.9% | 15%/14% | 15 | 7%/8% | 9.3% | 15%/12% | 69 | 7%/9% | 9.8% | 14%/11% | 35 | 1%/7% | 8.4% | 14%/9% | 31 | 0%/0% | 2.8% | 12%/7% | 38 | -2%/5% | 7.4% | 14%/12% | 37 | -0.02 |
| Germany | 246 | 0.41 | -0.48 | 9%/10% | 10.1% | 13%/11% | 34 | 6%/8% | 9.5% | 12%/10% | 74 | 5%/6% | 7.1% | 10%/8% | 54 | 0%/0% | 0.9% | 8%/5% | 19 | -2%/2% | 5.9% | 8%/6% | 40 | -2%/0% | 6.5% | 8%/7% | 25 | 0.00 |
| Hong Kong | 116 | 0.35 | -0.52 | 4%/8% | 9.1% | 12%/10% | 11 | 6%/6% | 7.0% | 10%/8% | 45 | 4%/5% | 5.4% | 9%/6% | 46 | 3%/5% | 6.2% | 8%/5% | 5 | 5%/4% | 6.0% | 7%/6% | 8 | 4%/4% | 4.4% | 4%/4% | 1 | 0.00 |
| Italy | 72 | 0.14 | 0.38 | | | | | | | | | -2%/4% | 5.6% | 6%/6% | 10 | -3%/0% | 1.8% | 7%/4% | 18 | -5%/-3% | -2.8% | 7%/-1% | 22 | -5%/-1% | 6.1% | 7%/7% | 22 | -0.01 |
| Japan | 234 | 0.41 | -0.39 | | | | | | | | | 7%/8% | 8.4% | 10%/10% | 34 | 3%/6% | 6.6% | 10%/7% | 17 | -2%/3% | 3.1% | 5%/4% | 28 | -7%/-3% | -1.4% | 2%/0% | 155 | 0.08 |
| Netherlands | 246 | 0.79 | -0.91 | 10%/14% | 14.8% | 18%/16% | 107 | 5%/7% | 8.9% | 15%/13% | 66 | -1%/3% | 6.8% | 10%/8% | 38 | -2%/-2% | -1.2% | 6%/5% | 22 | -1%/-1% | -1.2% | -1%/-1% | 6 | -2%/-1% | -1.2% | -1%/-1% | 7 | 0.03 |
| Norway | 238 | 0.01 | 0.14 | 6%/7% | 7.7% | 13%/9% | 67 | 2%/5% | 7.1% | 11%/9% | 86 | 3%/5% | 6.9% | 9%/8% | 44 | 4%/5% | 5.6% | 8%/7% | 17 | 4%/5% | 6.3% | 8%/7% | 8 | 4%/9% | 9.7% | 10%/10% | 16 | -0.02 |
| Singapore | 210 | 0.06 | -0.22 | 10%/10% | 9.8% | 10%/10% | 1 | 4%/5% | 5.6% | 9%/7% | 14 | 2%/3% | 3.5% | 10%/4% | 83 | 1%/4% | 4.2% | 9%/5% | 68 | 1%/4% | 4.6% | 7%/5% | 19 | 1%/2% | 3.0% | 7%/4% | 25 | 0.00 |
| Spain | 125 | 0.35 | -0.13 | 11%/12% | 12.7% | 14%/13% | 15 | 9%/10% | 10.9% | 13%/12% | 53 | 5%/8% | 10.7% | 12%/11% | 17 | 0%/1% | 2.9% | 10%/5% | 21 | -1%/1% | 0.8% | 2%/1% | 17 | 11%/11% | 10.8% | 11%/11% | 2 | 0.00 |
| Sweden | 235 | 0.48 | -0.19 | 13%/16% | 16.7% | 20%/18% | 56 | 8%/11% | 13.4% | 18%/15% | 76 | 5%/10% | 11.8% | 17%/13% | 62 | 4%/4% | 5.2% | 15%/14% | 20 | 0%/4% | 4.6% | 15%/12% | 11 | -1%/0% | 1.8% | 12%/10% | 10 | 0.00 |
| Switzerland | 246 | 0.60 | -0.72 | 11%/12% | 12.6% | 13%/13% | 9 | 7%/11% | 11.9% | 15%/13% | 107 | 6%/9% | 10.6% | 15%/11% | 77 | 1%/5% | 5.9% | 12%/9% | 22 | 1%/1% | 1.0% | 5%/1% | 14 | -1%/0% | 2.1% | 4%/3% | 17 | 0.00 |
| UK | 246 | 0.71 | -0.86 | 9%/12% | 12.6% | 14%/13% | 41 | 4%/7% | 9.3% | 12%/11% | 114 | 0%/2% | 5.9% | 9%/6% | 60 | 0%/1% | 1.1% | 7%/5% | 30 | 0%/0% | 0.3% | 0%/0% | 1 | | | | | 0.01 |
| USA | 246 | 0.61 | -0.84 | 9%/10% | 11.6% | 14%/13% | 42 | 9%/11% | 12.2% | 14%/13% | 79 | 2%/5% | 7.4% | 12%/9% | 56 | 0%/2% | 7.7% | 11%/8% | 43 | -1%/-1% | -0.5% | 0%/-1% | 19 | -1%/-1% | -1.1% | -1%/-1% | 7 | - |
| S&P s. 1979 | 246 | 0.60 | -0.83 | 9%/10% | 11.0% | 14%/13% | 39 | 7%/11% | 11.8% | 14%/13% | 66 | 3%/5% | 7.6% | 13%/11% | 66 | 1%/7% | 7.7% | 11%/8% | 44 | -1%/0% | -0.3% | 8%/0% | 21 | -1%/-1% | -0.8% | 0%/-1% | 10 | - |
| S&P s. 1871 | 1433 | 0.33 | -0.53 | 2%/10% | 10.9% | 16%/13% | 268 | -1%/4% | 6.9% | 15%/10% | 526 | -2%/1% | 4.6% | 14%/7% | 503 | -2%/4% | 7.5% | 12%/8% | 99 | -1%/0% | -0.1% | 10%/6% | 27 | -1%/-1% | -0.8% | 0%/-1% | 10 | -0.04 |
| MSCI Count. | 3649 | 0.33 | -0.15 | 1%/10% | 12.6% | 20%/15% | 568 | 2%/8% | 9.4% | 19%/12% | 1083 | -3%/5% | 7.5% | 17%/9% | 855 | -4%/2% | 5.8% | 15%/8% | 468 | -5%/1% | 4.1% | 15%/6% | 284 | -7%/-1% | 1.0% | 14%/7% | 391 | - |
| All Countries | 4836 | 0.28 | -0.13 | 1%/10% | 11.9% | 20%/15% | 794 | -1%/7% | 8.4% | 19%/11% | 1530 | -3%/4% | 6.5% | 17%/9% | 1302 | -4%/2% | 5.9% | 15%/8% | 524 | -5%/1% | 4.2% | 15%/6% | 292 | -7%/-1% | 1.0% | 14%/7% | 394 | - |

Figure 22: The average returns (median, "Med") over the subsequent 10-15 years in relation to PE are shown by country as well as the statistical relationship by reference to "R²" and the correlation ("Cor"). All returns are given in local currency, incl. dividend income, annualised and adjusted for inflation. The analysis of individual countries is for the period 12/1979-05/2015, insofar as the necessary fundamental and performance data (PE and CAPE for comparison) was available (Source: MSCI, own calculations). For the US, S&P 500 data since 01/1881 was also used (Source: Shiller [2015], own calculations). The final performance period taken into account is from 05/2000 to 05/2015. The "All Countries" row takes into account all 4836 months observed ("#"). The "Max" and "Min" columns represent the maximum and minimum of returns observed in the country, "75%" ("25%") the 75th (25th) percentile of real 10-15year returns. The grey rows "USA" (MSCI USA), "S&P s. 1979" (S&P 500 since 1979 based on Shiller data) and "MSCI Count." (only MSCI Countries) are shown for information purposes only and not included in "All Countries". The "R² Δ" column indicates the extent to which the R² of "All Countries" changes without the respective country.

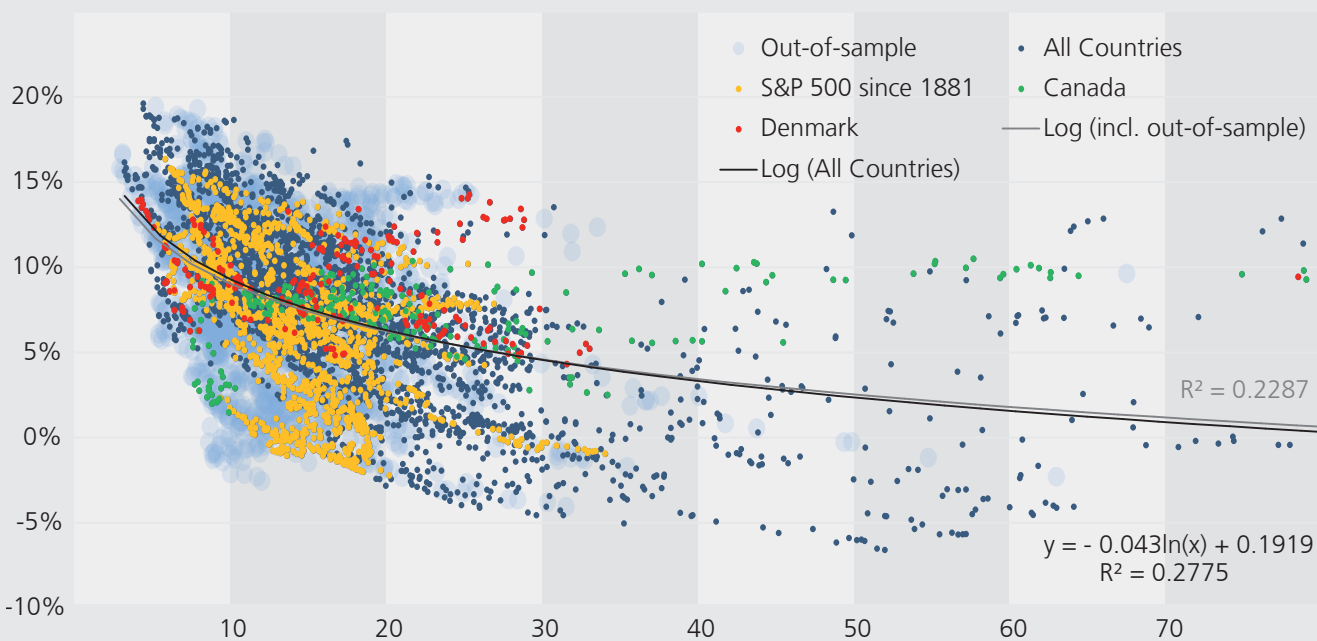## Relationship between PE and average real returns of the subsequent 10-15 years (p.a.)



Figure 23: The relationship between PE and the returns of the subsequent 10-15 years for the period 01/1881-05/2015 (S&P 500) and 12/1979-05/2015 (other MSCI Countries) are shown in this chart. The three countries that had the highest absolute effect in terms of "R² Δ" are highlighted. All returns are adjusted for inflation, in local currency, incl. dividend income and annualised. The black regression function applies to "All Countries". The available out-of-sample data (that is data from 12/1969 to 12/1979 and data since 12/1979 that contained no CAPE) can be seen in light-blue data points, with the light grey regression representing all in and out-of-sample data. Source: S&P 500: Shiller [2015], other countries: MSCI and own calculations.

$$y = -0.043\ln(x) + 0.1919$$
$$R^2 = 0.2775$$

$$R^2 = 0.2287$$

## Relationship between PC and average real returns of the subsequent 10-15 years (p.a.)

| Country | # | R² | Cor | 0 - 4 Min/25% | Med | Max/75% | # | 4 - 6 Min/25% | Med | Max/75% | # | 6 - 8 Min/25% | Med | Max/75% | # | 8 - 10 Min/25% | Med | Max/75% | # | 10 - 12 Min/25% | Med | Max/75% | # | >=12 Min/25% | Med | Max/75% | # | R² Δ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Australia | 246 | 0.54 | -0.72 | | | | | 10%/12% | 12.3% | 13%/12% | 13 | 6%/7% | 8.3% | 12%/10% | 96 | 5%/7% | 7.9% | 10%/9% | 54 | 4%/6% | 7.5% | 8%/8% | 57 | 4%/5% | 5.0% | 6%/5% | 26 | 0.00 |
| Belgium | 246 | 0.90 | -0.96 | 14%/15% | 15.8% | 19%/17% | 73 | 5%/8% | 9.1% | 14%/11% | 91 | -1%/3% | 7.3% | 9%/8% | 55 | -4%/-3% | -2.4% | -1%/-3% | 16 | -4%/-4% | -3.3% | -2%/-3% | 11 | | | | | 0.02 |
| Canada | 246 | 0.01 | 0.03 | | | | | 2%/3% | 4.4% | 9%/7% | 28 | 1%/7% | 7.9% | 10%/8% | 87 | 5%/6% | 8.4% | 10%/9% | 66 | 5%/6% | 6.8% | 10%/10% | 51 | 2%/3% | 4.6% | 10%/8% | 14 | -0.02 |
| Denmark | 246 | 0.47 | -0.70 | 11%/12% | 13.1% | 14%/14% | 13 | 8%/9% | 11.0% | 14%/13% | 36 | 7%/9% | 9.4% | 13%/12% | 59 | 6%/7% | 8.7% | 12%/11% | 80 | 5%/6% | 6.8% | 11%/8% | 39 | 4%/5% | 5.5% | 10%/6% | 19 | -0.01 |
| France | 225 | 0.88 | -0.94 | 12%/13% | 13.5% | 15%/14% | 31 | 8%/9% | 10.1% | 14%/12% | 79 | 7%/8% | 8.2% | 11%/9% | 59 | 2%/4% | 5.6% | 8%/7% | 16 | 0%/1% | 3.0% | 7%/6% | 23 | -2%/-2% | 0.0% | 5%/0% | 17 | 0.02 |
| Germany | 246 | 0.82 | -0.93 | 7%/10% | 10.3% | 13%/11% | 54 | 5%/8% | 7.7% | 11%/9% | 122 | 5%/6% | 6.3% | 7%/7% | 29 | 0%/-1% | 1.0% | 5%/0% | 30 | -2%/-1% | -0.8% | 0%/0% | 9 | -1%/-1% | -1.1% | -1%/-1% | 2 | -0.02 |
| Hong Kong | 116 | 0.31 | -0.51 | | | | | 6%/6% | 6.3% | 6%/6% | 1 | 4%/5% | 5.2% | 11%/8% | 3 | 7%/8% | 8.2% | 12%/9% | 18 | 6%/6% | 6.8% | 10%/7% | 26 | 3%/5% | 5.6% | 9%/6% | 68 | -0.01 |
| Italy | 74 | 0.85 | -0.92 | 7%/7% | 7.0% | 7%/7% | 3 | 5%/6% | 6.4% | 7%/7% | 26 | -2%/2% | 3.6% | 6%/4% | 10 | -3%/-3% | 0.1% | 6%/2% | 15 | -4%/-3% | -2.9% | -2%/-3% | 14 | -5%/-5% | -4.5% | -4%/-4% | 6 | -0.01 |
| Japan | 246 | 0.82 | -0.87 | | | | | | | | | 1%/7% | 8.1% | 10%/9% | 43 | -2%/0% | 2.2% | 8%/4% | 68 | -4%/-2% | -0.9% | 1%/0% | 52 | -7%/-5% | -3.0% | 0%/-2% | 83 | 0.03 |
| Netherlands | 246 | 0.90 | -0.94 | 13%/14% | 15.0% | 18%/16% | 83 | 8%/10% | 11.0% | 16%/14% | 67 | 4%/6% | 7.0% | 10%/8% | 48 | 0%/2% | 3.2% | 7%/6% | 11 | -2%/-2% | -0.9% | 1%/0% | 18 | -2%/-1% | -1.3% | 0%/-1% | 19 | 0.05 |
| Norway | 246 | 0.21 | -0.40 | 6%/7% | 8.3% | 13%/10% | 66 | 3%/6% | 7.1% | 11%/8% | 75 | 2%/5% | 6.9% | 11%/9% | 81 | 4%/5% | 6.5% | 10%/9% | 22 | 8%/8% | 7.6% | 8%/5% | 2 | | | | | -0.04 |
| Singapore | 210 | 0.03 | -0.12 | | | | | | | | | 7%/8% | 8.1% | 10%/9% | 4 | 4%/5% | 5.6% | 9%/6% | 10 | 2%/3% | 4.1% | 10%/4% | 64 | 1%/2% | 3.5% | 9%/5% | 132 | 0.01 |
| Spain | 125 | 0.87 | -0.95 | 12%/12% | 12.2% | 14%/14% | 8 | 9%/10% | 11.0% | 13%/12% | 64 | 4%/6% | 8.9% | 12%/11% | 21 | 0%/1% | 1.5% | 5%/3% | 18 | -1%/0% | 0.5% | 1%/1% | 13 | -1%/-1% | -0.6% | -1%/-1% | 1 | 0.01 |
| Sweden | 246 | 0.65 | -0.80 | 15%/16% | 17.5% | 20%/19% | 29 | 13%/14% | 15.8% | 18%/17% | 30 | 11%/12% | 14.5% | 18%/15% | 53 | 8%/11% | 12.1% | 15%/13% | 75 | 6%/6% | 7.4% | 15%/12% | 12 | 4%/4% | 5.2% | 15%/12% | 47 | -0.04 |
| Switzerland | 245 | 0.63 | -0.88 | 11%/12% | 12.5% | 13%/13% | 7 | 7%/8% | 11.9% | 13%/13% | 63 | 11%/12% | 12.5% | 15%/13% | 51 | 9%/11% | 11.0% | 13%/10% | 47 | 8%/9% | 9.1% | 10%/10% | 19 | -1%/-1% | 2.0% | 8%/6% | 58 | -0.01 |
| UK | 246 | 0.85 | -0.93 | 12%/12% | 12.4% | 13%/13% | 10 | 11%/12% | 12.3% | 14%/13% | 44 | 6%/8% | 9.6% | 12%/13% | 72 | 4%/5% | 6.1% | 9%/6% | 52 | 1%/3% | 5.6% | 9%/6% | 42 | 0%/1% | 0.7% | 1%/1% | 26 | 0.01 |
| USA | 246 | 0.82 | -0.93 | | | | | 9%/10% | 11.9% | 14%/13% | 49 | 9%/11% | 12.2% | 14%/13% | 75 | 5%/7% | 7.9% | 12%/9% | 45 | 2%/4% | 7.7% | 8%/8% | 40 | -1%/-1% | -0.4% | 2%/1% | 37 | 0.01 |
| MSCI Count. | 3701 | 0.45 | -0.65 | 6%/11% | 14.1% | 20%/16% | 377 | 2%/8% | 9.9% | 18%/12% | 788 | -2%/7% | 8.5% | 18%/11% | 846 | -4%/5% | 7.4% | 15%/10% | 643 | -4%/1% | 5.5% | 15%/8% | 492 | -7%/0% | 2.7% | 15%/5% | 555 | - |

Figure 24: This table shows the average returns (median, "Med") over the following 10-15 years depending on the PC by country as well as the statistical relationship by reference to "R²" and the correlation ("Cor"). All returns are given in local currency, incl. dividend income, annualised and adjusted based on local CPI indexes (Source: Datastream). The analysis of individual countries covers the period 12/1979 to 05/2015, insofar as the necessary fundamental and performance data (PC and CAPE for comparison) was available (Source: MSCI, own calculations). The last performance period is 05/2000-05/2015. The row "MSCI Count." spans all 3701 months in the sample ("#"). The "Min" and "Max" columns show the observed minimums and maximums and "75%" ("25%") the 75th (25th) percentile of real 10-15 years returns. The column "R² Δ" indicates the extent to which the R² of "MSCI Count." (only MSCI Countries) changes without the respective country.

## Relationship between PC and average real returns of the subsequent 10-15 years (p.a.)



$$y = -0.065\ln(x) + 0.2075$$
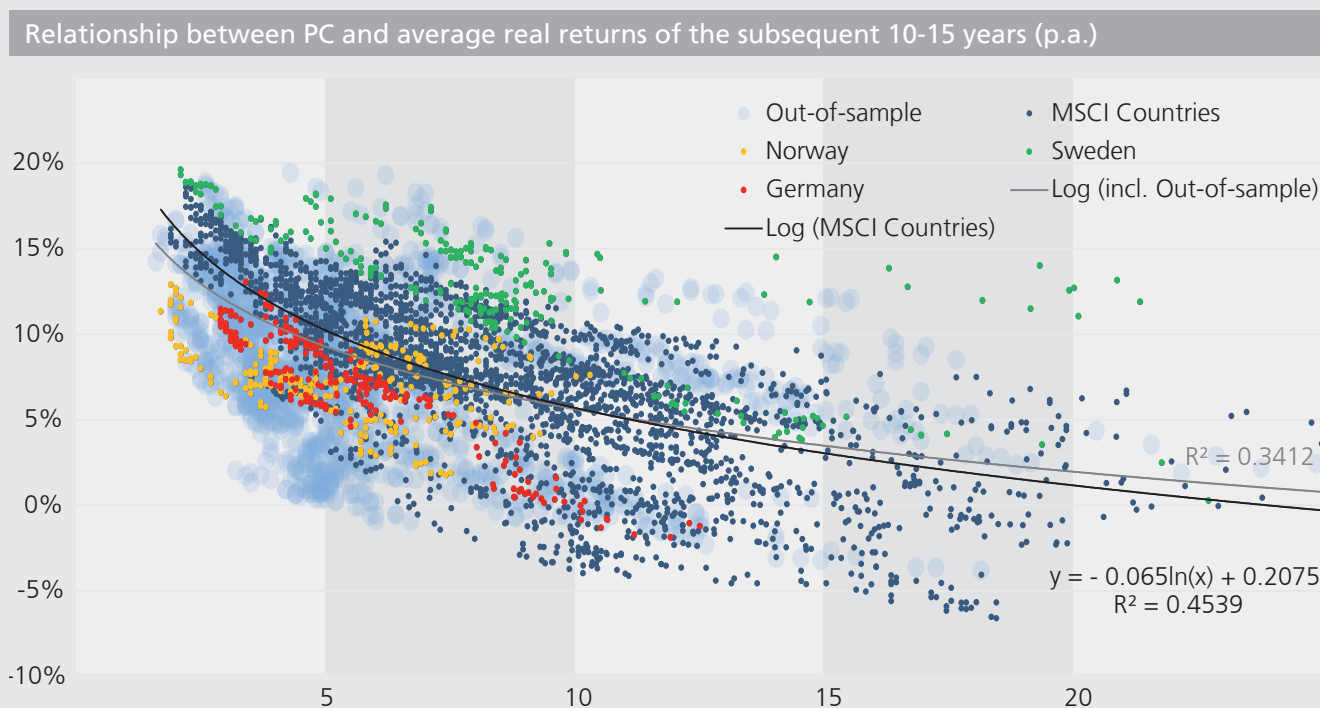$$R^2 = 0.4539$$

$$R^2 = 0.3412$$

Figure 25: The chart displays the relationship between PC and the returns of the following 10-15 years in the period 12/1979-05/2015. The three countries that had the highest absolute effect in terms of "R² Δ" are highlighted. All returns are adjusted for inflation, in local currency, incl. dividend income and annualised. The black regression function applies to "MSCI Countries". The available out-of-sample data (that is data from 01/1970 to 12/1979 and data since 12/1979 that contained no CAPE) can be seen in light-blue data points with a light grey regression function for in and out-of-sample data. Source: MSCI and own calculations.

## Relationship between DY and average real returns of the subsequent 10-15 years (p.a.)

| Country | # | R² | Cor | 0-1 Min/25% | Med | Max/75% | # | 1-2 Min/25% | Med | Max/75% | # | 2-3 Min/25% | Med | Max/75% | # | 3-4 Min/25% | Med | Max/75% | # | 4-5 Min/25% | Med | Max/75% | # | >=5 Min/25% | Med | Max/75% | # | R² Δ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Australia | 246 | 0.43 | 0.61 | | | | | | | | | 4%/5% | 4.9% | 7%/5% | 18 | 5%/6% | 7.5% | 10%/8% | 114 | 6%/8% | 8.4% | 12%/10% | 73 | 7%/8% | 8.5% | 13%/12% | 41 | 0.00 |
| Belgium | 246 | 0.92 | 0.87 | | | | | -4%/-4% | -4.0% | -4%/-4% | 4 | -4%/-3% | -2.5% | 0%/-1% | 26 | -1%/1% | 2.7% | 8%/5% | 22 | 4%/5% | 7.6% | 9%/8% | 56 | 8%/10% | 14.4% | 19%/16% | 138 | 0.03 |
| Canada | 246 | 0.02 | 0.05 | | | | | 2%/5% | 5.3% | 7%/6% | 37 | 6%/8% | 9.3% | 10%/10% | 60 | 1%/7% | 7.8% | 10%/8% | 127 | 3%/4% | 5.5% | 9%/7% | 16 | 7%/8% | 8.0% | 9%/9% | 6 | -0.01 |
| Denmark | 246 | 0.23 | 0.44 | 9%/10% | 9.9% | 10%/10% | 3 | 4%/7% | 7.7% | 12%/10% | 131 | 6%/9% | 10.9% | 14%/12% | 75 | 9%/9% | 9.0% | 9%/9% | 10 | 8%/9% | 8.8% | 9%/9% | 9 | 10%/11% | 12.6% | 14%/13% | 18 | -0.04 |
| France | 225 | 0.70 | 0.73 | | | | | -2%/-2% | -1.2% | 0%/0% | 12 | 0%/3% | 7.3% | 11%/9% | 75 | 7%/8% | 8.4% | 14%/9% | 87 | 10%/12% | 12.1% | 15%/12% | 24 | 13%/13% | 13.5% | 15%/14% | 27 | 0.01 |
| Germany | 246 | 0.70 | 0.76 | | | | | -2%/-1% | 0.2% | 3%/1% | 23 | 0%/5% | 6.4% | 8%/7% | 79 | 5%/7% | 7.9% | 11%/9% | 79 | 7%/10% | 10.5% | 13%/11% | 29 | 9%/10% | 10.1% | 11%/11% | 36 | 0.01 |
| Hong Kong | 116 | 0.83 | 0.92 | | | | | | | | | 3%/4% | 4.7% | 7%/6% | 27 | 5%/6% | 6.1% | 8%/6% | 56 | 6%/7% | 7.5% | 9%/8% | 23 | 9%/9% | 9.5% | 12%/10% | 10 | 0.00 |
| Italy | 74 | 0.22 | 0.47 | | | | | -5%/-3% | -1.5% | 7%/6% | 49 | -5%/4% | 5.7% | 7%/6% | 25 | | | | | | | | | | | | | 0.01 |
| Japan | 246 | 0.94 | 0.97 | -7%/-3% | -1.7% | 2%/-1% | 158 | -1%/3% | 5.4% | 10%/8% | 79 | 9%/9% | 10.1% | 10%/10% | 9 | | | | | | | | | | | | | 0.10 |
| Netherlands | 246 | 0.87 | 0.87 | | | | | -2%/-2% | -1.8% | -1%/-1% | 9 | -2%/-1% | -0.9% | 3%/0% | 34 | 4%/6% | 6.8% | 13%/7% | 45 | 9%/9% | 12.5% | 15%/14% | 91 | 15%/15% | 15.4% | 18%/17% | 67 | 0.02 |
| Norway | 246 | 0.20 | 0.49 | | | | | 2%/5% | 7.0% | 10%/9% | 98 | 2%/6% | 6.7% | 11%/7% | 61 | 6%/6% | 7.2% | 9%/7% | 55 | 7%/8% | 8.8% | 11%/10% | 8 | 8%/9% | 10.0% | 13%/12% | 24 | 0.00 |
| Singapore | 210 | 0.66 | 0.84 | 1%/2% | 2.2% | 2%/2% | 3 | 1%/3% | 3.4% | 8%/4% | 163 | 4%/6% | 6.5% | 10%/7% | 37 | 8%/9% | 9.3% | 10%/9% | 7 | | | | | | | | | 0.02 |
| Spain | 125 | 0.91 | 0.90 | | | | | -1%/0% | 0.8% | 2%/1% | 26 | 2%/4% | 5.0% | 7%/7% | 16 | 9%/10% | 10.8% | 12%/12% | 32 | 9%/10% | 10.9% | 13%/12% | 33 | 10%/12% | 12.2% | 14%/13% | 18 | 0.01 |
| Sweden | 246 | 0.53 | 0.67 | -1%/2% | 5.2% | 11%/8% | 2 | 0%/5% | 10.1% | 15%/12% | 87 | 6%/12% | 13.5% | 18%/15% | 94 | 13%/14% | 14.7% | 18%/16% | 27 | 15%/15% | 15.7% | 17%/16% | 13 | 16%/17% | 18.5% | 20%/19% | 23 | -0.06 |
| Switzerland | 246 | 0.62 | 0.71 | 1%/1% | 1.1% | 1%/1% | 1 | -1%/1% | 6.8% | 12%/9% | 95 | 7%/11% | 11.9% | 15%/13% | 115 | 8%/9% | 11.2% | 13%/11% | 35 | | | | | | | | | -0.03 |
| UK | 246 | 0.72 | 0.83 | | | | | | | | | 0%/1% | 0.8% | 2%/1% | 35 | 3%/4% | 5.6% | 10%/6% | 33 | 4%/6% | 8.2% | 12%/9% | 106 | 6%/8% | 12.2% | 14%/13% | 72 | 0.00 |
| USA | 246 | 0.84 | 0.83 | | | | | -1%/-1% | -0.3% | 3%/1% | 41 | 3%/5% | 7.4% | 11%/8% | 54 | 8%/9% | 10.8% | 13%/12% | 76 | 9%/11% | 12.7% | 14%/13% | 37 | 10%/10% | 11.6% | 14%/13% | 38 | - |
| S&P s. 1979 | 246 | 0.85 | 0.85 | | | | | -1%/-1% | -0.3% | 3%/1% | 41 | 3%/6% | 7.5% | 11%/8% | 64 | 8%/9% | 10.5% | 13%/12% | 70 | 9%/11% | 11.6% | 14%/13% | 51 | 10%/11% | 12.1% | 14%/13% | 20 | - |
| S&P s. 1871 | 1433 | 0.27 | 0.51 | | | | | -1%/-1% | -0.3% | 3%/1% | 41 | 1%/1% | 3.9% | 11%/7% | 122 | -2%/1% | 4.6% | 13%/7% | 369 | -1%/5% | 7.1% | 14%/8% | 396 | 0%/5% | 9.3% | 16%/12% | 505 | -0.14 |
| MSCI Count. | 3702 | 0.45 | 0.60 | -7%/-3% | -1.6% | 11%/0% | 167 | -5%/2% | 4.8% | 15%/8% | 854 | -5%/5% | 7.5% | 18%/11% | 840 | -1%/5% | 7.9% | 18%/11% | 805 | 3%/5% | 9.6% | 17%/12% | 518 | 6%/10% | 12.3% | 20%/15% | 518 | - |
| All Countries | 4889 | 0.30 | 0.51 | -7%/-3% | -1.6% | 11%/0% | 167 | -5%/2% | 4.8% | 15%/8% | 854 | -5%/4% | 7.2% | 18%/11% | 908 | -2%/5% | 7.2% | 18%/9% | 1098 | -1%/6% | 8.0% | 17%/11% | 877 | 0%/8% | 10.8% | 20%/13% | 985 | - |

Figure 26: The table shows the average returns (median, "Med") over the subsequent 10-15 years depending on the dividend yield by country as well as the statistical relationship by reference to "R²" and the correlation ("Cor"). All returns are given in local currency, incl. dividend income, annualised and using local CPI. The analysis of the individual countries is for 12/1979 to 05/2015, insofar as the necessary fundamental and performance data (dividend yields and CAPE for comparison) was available (Source: MSCI, own calculations). The last performance period is 05/2000-05/2015. The row "All Countries" spans all 4889 months in the sample ("#"). The "Max" and "Min" columns represent the maximum and minimum of returns observed in the country, "75%" ("25%") the 75th (25th) percentile of real 10-15 years returns. The grey rows "USA" (MSCI USA), "S&P s. 1979" (S&P 500 since 12/1979 based on Shiller data) and "MSCI Count." (only MSCI Countries) are shown for informational purposes only and are not included in "All Countries". The column "R² Δ" indicates the extent to which the R² of "All Countries" changes without the respective country.

## Relationship between DY and average real returns of the subsequent 10-15 years (p.a.)



$$y = 0.0446\ln(x) + 0.0216$$
$$R^2 = 0.2956$$

$$R^2 = 0.2889$$

Legend: Out-of-sample · All Countries · S&P 500 since 1881 · Sweden · Denmark · Log (incl. Out-of-sample) · Log (All Countries)
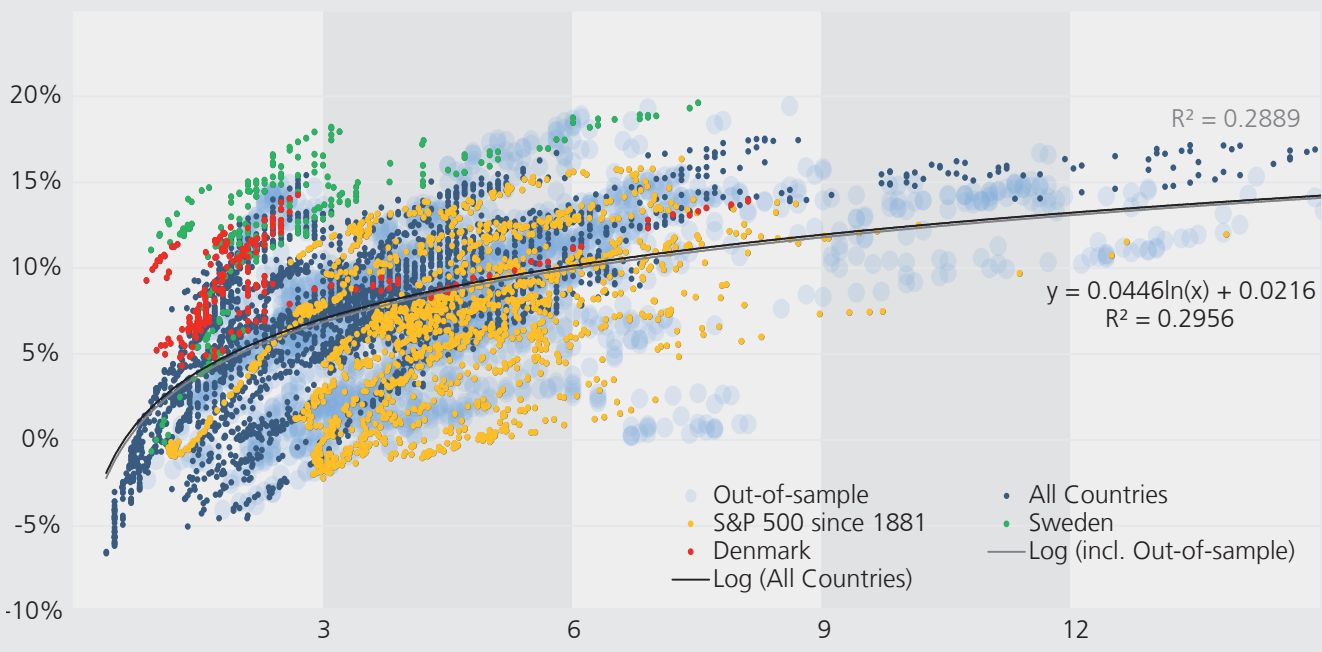
Figure 27: The chart displays the relationship between the dividend yield and the returns of the subsequent 10-15 years in the period 01/1881-05/2015 (S&P 500) and 12/1979-05/2015 (other MSCI Countries). The three countries that had the highest absolute effect in terms of "R² Δ" are highlighted. All returns are adjusted for inflation, in local currency, incl. dividend income and annualised. The black regression function applies to "All Countries". The available out-of-sample data (that is data from 12/1969 to 12/1979 and data since 12/1979 that contained no CAPE) can be seen in light-blue data points with a light grey regression function for in and out-of-sample data. Source: S&P 500: Shiller [2015], other countries: MSCI and own calculations.
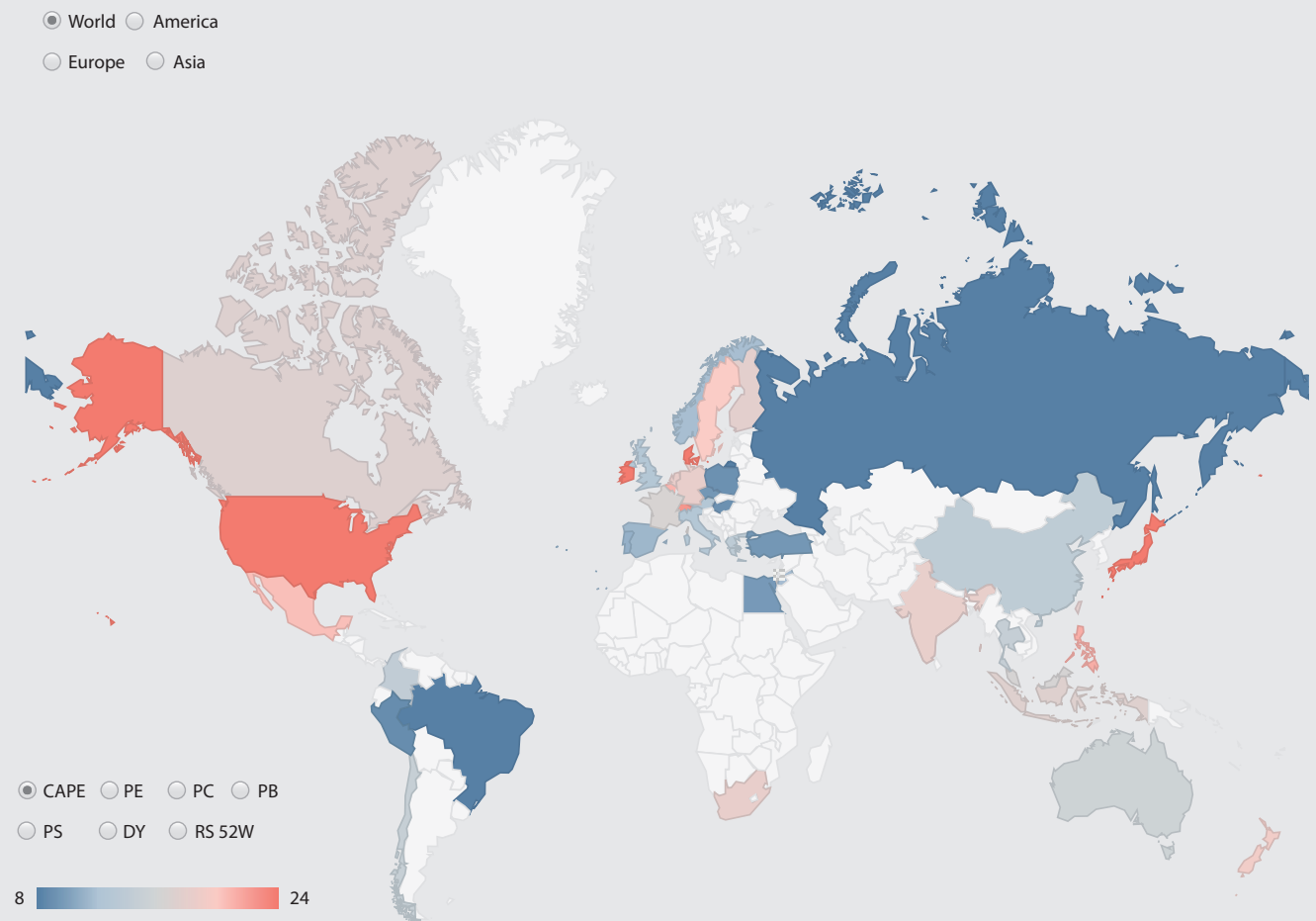
## Further information

Supplementary and current information regarding international stock market valuation is available on

starcapital.de/research/stockmarketvaluation

Long-term return estimates based on fundamental indicators are available on

starcapital.de/research/CAPE_Stock_Market_Expectations

◉ World  ◯ America
◯ Europe  ◯ Asia



◉ CAPE  ◯ PE  ◯ PC  ◯ PB
◯ PS  ◯ DY  ◯ RS 52W

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## Information about the author

Norbert Keimling, born 1979, leads the capital markets research section of StarCapital AG. After studying business informatics, he worked for the quantitative research division of AMB Generali in Cologne. Since 2004, he has been working for StarCapital AG in Oberursel.

StarCapital provides complete asset management services for their customers based on mutual funds. The staff of StarCapital relies on the long-standing stock market experience of Peter E. Huber and the inhouse capital markets research. Currently, Star Capital manages assets totalling about EUR 2 billion.

*Das Ganze sehen, die Chancen nutzen.*