



## Two decades of CROCI Strategies

### [A handbook for understanding the performance of CROCI strategies and the underlying philosophy](#)

The CROCI investment strategies turned twenty years old this year. When the first strategies were launched, it was only a few years after the dotcom bubble whilst the Global Financial Crisis was still a few years down the line. The twenty years since 2004 have witnessed a wide range of economic environments. Over that total period, CROCI strategies have all materially outperformed both broad and value benchmarks.

There are now eight off-the-shelf strategies with associated funds, including regional, global, income and thematic strategies. Most of these strategies are driven by valuation; the notable current exception is the quality-focused CROCI Innovation Leaders strategy (formerly known as CROCI Intellectual Capital), although there is also a growth strategy in the works.

The questions that we want to investigate in the first section of this paper are a) what have the optimum outperformance periods been and b) what sorts of markets have led to underperformance. We look at attribution analysis, up and downside capture ratios amongst other tools to help understand the underlying nature of these strategies over the past twenty years. The remaining two sections, look at the CROCI philosophy in detail, covering the following aspects:

**Stability of the approach and platform** – The creation of the CROCI philosophy predates the launch of its first investment strategies by nearly a decade. For nearly 30 years, CROCI has had an unremitting commitment to fundamental bottom-up analysis for each company under coverage. The investment professionals behind CROCI have also been very stable. The average tenure of the CROCI management team is nearly twenty years. Similar longevity can be found in the CROCI sector specialists and investment strategy team.

**Creation of a level playing field** – CROCI's community of company analysts ensures a consistent cross-sector approach by using a standardised valuation model. This aims to eliminate model risk and forecasting variation. In the knowledge that nearly all companies have a nearly identical fundamental goal—to generate cash flows from their real economic assets—the CROCI process seeks to achieve a level playing field for comparing company valuation across all industries, so that apples are always compared to apples. This allows economic PE to be comparable across global large-cap companies and thereby generate alpha through bottom-up stock picking.

**Limited overlap between conventional & economic PE** – Typically, a value approach suggests holding stocks with low conventional PE ratios or high dividend yields. Unfortunately, such signals are not reliable for determining whether stocks are as cheap as they seem. Equally, a high conventional PE ratio is not inconsistent with being a genuine value stock. Genuine economic value can often look very different to conventional definitions of value.

**Creation of CROCI investment strategies** – Using one of the oldest CROCI strategies as an example, we explain how the strategy stays true to the principles of identifying economic value. Identification of value stocks based on Economic PE is the bedrock of most of the CROCI investment strategies. However, there are other CROCI strategies which are more thematic in nature.

**Combining the best of both systemic and active** – CROCI follows a rules-based portfolio construction strategy, which aims to eliminate style drift or key individual risk. At the same time, CROCI strategies tend to be concentrated and high conviction, with high active share and the aim of generating significant alpha.

**Authors and Contributors:**

**Colin McKenzie**

CROCI Product Specialist / Head of CROCI Intelligence

**Virginie Galas**

Head of CROCI Company Research

**Dirk Schlueter**

Head of CROCI Investment Strategies

**Jay Joshi**

DWS Research Institute

**Venkat Bijjaram**

CROCI Company Research

**Mital Parekh**

CROCI Investment Strategies

**Pragya Patwari**

CROCI Investment Strategies

**Vikash Sonika**

CROCI Investment Strategies

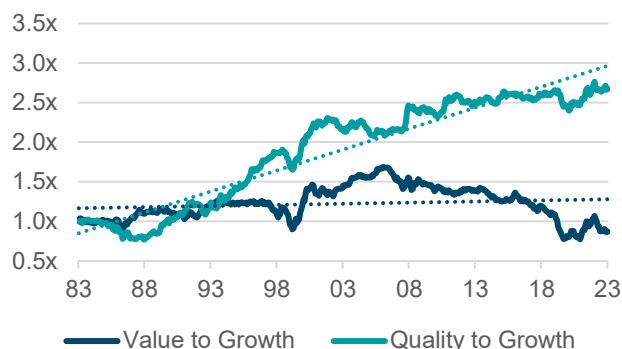
## Section I:

### Performance of CROCI Strategies

### 1.1 Performance of the broader benchmarks over long term

The continuous objective of any active investment strategy is to achieve a long-term performance record superior to that of its benchmark. Relevant benchmarks are intended to provide a proxy for the leading public companies over the long term. Before getting to the performance of the CROCI strategies, we try to understand what broad benchmarks have achieved over the long term. Figure 2 provides a perspective of the performance of the value, growth, and quality benchmarks over the span of last four decades. A couple of broad trends emerge from the following figure: a) While value enjoyed a long period of advantage starting from 1980s until the Global Financial Crisis (GFC), something changed after that; and b) except for a small period of quality underperformance during the late 1980s, quality has had an almost secular advantage over both growth and value.

Figure 1: Ratio of Value, Quality to Growth Index (1984-2023)



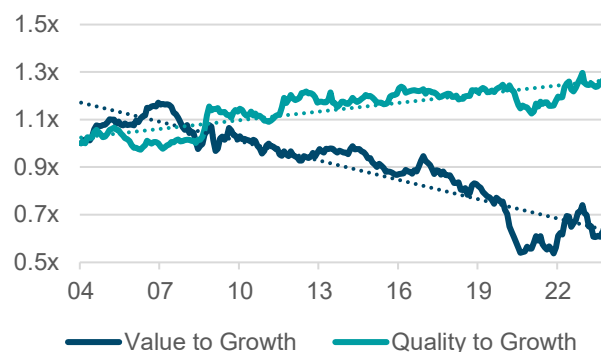
Source: DWS CROCI, FactSet, MSCI World indices: MSCI World Value, MSCI World Growth, MSCI World Quality. The exhibit covers period between 31 December 1983 and 31 December 2023.

### 1.2 Splitting the forty-year period into two equal halves

We can check the correlation of the performances of value and quality relative to growth to better understand the divergence in the two periods. We begin with looking at the correlation of the two variables in Figure 1 and Figure 2 across two distinct time periods of twenty years each -> 1984-2003 and 2004-2023. The correlation between value to growth and quality to growth was +0.7 between 1984 and 2003. The correlation coefficient between the two ratios drops to -0.7 between 2004-2023. In other words, markets tended to associate value and quality very closely (contesting against growth) in the two decades starting from 1984, but then the relationship turned almost on its head during the period of twenty years starting from 2004. This negative correlation comes to the fore in Figure 2—after the financial crisis, when value saw a prolonged phase of relative underperformance. The prolonged global monetary policy-led easing cycle generated ultra-loose conditions and funnelled liquidity into risk assets. This trend became more marked after 2017, when value saw increased relative underperformance right

until the onset of the pandemic. During this phase, quality managed to hold its own against growth. It was only during 2022 that value managed to recoup some of this. However, the principle of long-term mean reversion combined with dramatic reversals in interest rates suggests that value has significant scope to outperform again.

Figure 2: Ratio of Value, Quality to Growth Index (2004-2023)



Source: DWS CROCI, FactSet, MSCI World. The exhibit covers period between 31 January 2004 and 31 December 2023.

### 1.3 This time is different?

So far, we have covered a period of forty years. Using academic data published by Ken French, we can dig two decades further into the history and examine the relationship between factors ultimately over the period of past six decades. Parsing through the monthly returns of value, growth and quality in the U.S. and putting them into the context of the prevailing interest rates (nominal 10Y UST) throw some interesting insights. Even though value has outperformed growth over the long term, the value factor underperformed during months when interest rates were at the lower end of the spectrum. It will not be a surprise to readers that all these months fall between 2008-2022. There is a direct link between the two: lower interest rates and massive excess liquidity following the financial crisis led to asset inflation which disproportionately benefited growth equities. But there is also an indirect link to consider: interest remained so low (and quantitative easing persisted) for so long because economic growth was anaemic, and productivity recovered only slowly in the wake of the financial crisis. Arguably this resulted in markets chasing up the (increasingly few) companies that managed to sustain revenue growth, paying ever higher valuations for them—this benefited growth over value in style terms.

However, after the recent rise in the rates, the question is where the rates are headed in the future. If the rates are expected to be higher for longer, history suggests value should retain its advantage over growth.

Figure 3: Annualised excess returns across interest rates regime by Factors

Rates regime	Growth	Value	Quality	Month count
< 3%	3.7%	-0.9%	2.3%	138
3% to 6%	-1.0%	5.2%	2.8%	247
> 6%	-1.6%	4.9%	-0.3%	335

Source: DWS, Federal Reserve Economic Data, Fama French Three Factor Asset Pricing Method. Value is the bottom decile and growth is the top decile in price to book ratios, of U.S. stocks. Quality is the top decile in terms of ROE. Years covered 1964 to 2023. Return implies annualized monthly return for each factor compared to overall market return during the respective interest rate regime. The interest rates are month end nominal 10Y market yield on U.S. Treasury securities. Quick guide to read the exhibit: there were 138 months during the past sixty years that the 10Y UST month end reading stayed below 3%, 247 months when it was between 3% to 6% and 335 months when it was above 6%.

### 1.4 Performance of CROCI Strategies

The first CROCI investment strategies and funds were launched in 2004. Assuming one had invested in the MSCI World at the beginning of 2004, the investment would have grown at an annualised rate of 7.8% in USD terms up until the end of 2023. For a value investor, it is also important to get a sense of the returns generated by the value index of the same benchmark, which stand at 6.3%. Over the same period, the MSCI World Growth index generated returns of 9.1%. Clearly, value investors had the odds stacked against them over much of the period since 2004. As we saw in Figure 2, while the ratio of value to growth has consistently remained below 1.0x, it is the period between 2017 and the pandemic which saw accentuated underperformance of value as a strategy versus growth. However, the combination of quality with value in Economic PE has helped CROCI strategies to outperform their respective benchmarks over the past two decades. Quality was able to provide a tailwind in periods where conventional value substantially underperformed.

Most CROCI investment strategies use Economic PE to select attractively priced quality businesses. Such companies generally have better margins, cash returns, free cash flow conversion and lower leverage than traditional value companies, such as those looking attractive on conventional PE. These characteristics show the quality exposures that CROCI strategies tend to have.

Figure 4 provides a detailed overview of the performances of the CROCI strategies, broken down into five distinct periods, covering a cumulative period of two decades. To begin with, after the TMT bubble, there was strong outperformance of CROCI strategies versus their benchmarks. The numbers also clearly show the strong performance of CROCI strategies during the financial crisis period. In fact, what is

apparent from the table below is that except for the 2018-2021 period (where the market was driven first by growth and momentum and later by an abnormal amount of liquidity during the COVID crisis), most CROCI strategies performed solidly in every other style period. The past few years have been challenging compared to the wider market, with the pandemic and then more recently AI euphoria. Nevertheless, CROCI strategies have in aggregate outperformed more often than they have underperformed (Figure 5), even compared to the broader market.

To examine the drivers of performance, we have taken the Barra risk factor attribution of the CROCI US strategy as an example. Figure 6 shows the contribution of select style factors to active returns versus the S&P 500 since 2004<sup>1</sup>. Fundamental factors such as valuation, quality and profitability have contributed positively to the outperformance of the strategy versus the broad benchmark. On the other hand, tactical factors such as momentum, liquidity, earnings variability have hurt the relative performance of CROCI US vis-à-vis S&P 500. This ties in with what we can see in Figure 4 where we can see underperformance of CROCI US versus S&P 500 during the previous decade, possibly driven by lack of exposure to momentum and liquidity factors. However, this period was followed by two years of solid outperformance of S&P 500, when inflation-led market concerns contributed to fundamental factors such as quality and valuation growing in prominence once again. We also examine the contribution of select style factors to active returns of CROCI Japan since 2004. Here, too, the bulk of the outperformance versus TOPIX 100 was driven by fundamental/quality factors, only partly offset by Momentum.

Figure 8 highlights the top 10 best monthly excess returns across three of the oldest CROCI strategies – CROCI US, Euro, and Japan. The rows in green are when the benchmarks saw a correction. Across each of the strategies, some of the best monthly active returns have been during period of correction in broader markets. We cover this defensive aspect of CROCI strategies in further detail in 1.5.

<sup>1</sup> The CROCI team publishes the full Barra multi-factor attributions since 2004 for all key CROCI strategies if investors wish to look at the full performance attribution in more detail.

Figure 4: Annualised returns for select CROCI strategies over various periods

	<i>Pre-Crisis Market</i>	<i>Financial Crisis</i>	<i>Rising Liquidity</i>	<i>Growth/ Momentum</i>	<i>Inflationary period</i>	<i>Entire time period</i>
	<b>2004-2007</b>	<b>2008-2009</b>	<b>2010-2017</b>	<b>2018-2021</b>	<b>2022-2023</b>	<b>2004-2023<sup>^</sup></b>
<b>CROCI US</b>	14.6%	-6.0%	12.8%	11.6%	5.8%	10.2%
vs. MSCI USA Value	5.1%	7.5%	1.0%	1.9%	5.4%	3.2%
vs. S&P 500	6.1%	5.3%	-0.4%	-5.4%	4.6%	1.2%
<b>CROCI Euro</b>	19.7%	-12.1%	10.4%	6.5%	1.2%	8.0%
vs. MSCI EMU Value	1.8%	4.7%	5.5%	3.7%	-4.5%	3.4%
vs. ESTOXX 50	4.6%	2.8%	5.2%	-1.2%	-3.9%	2.6%
<b>CROCI Japan</b>	13.3%	-18.0%	12.3%	7.9%	18.3%	8.7%
vs. MSCI Japan Value	-0.4%	-1.5%	3.0%	5.5%	-1.2%	1.9%
vs. TOPIX 100	3.3%	3.8%	2.2%	1.4%	6.0%	2.8%
<b>CROCI World</b>	21.6%	-0.8%	10.4%	11.0%	5.2%	11.0%
vs. MSCI World Value	7.8%	12.3%	1.7%	4.0%	3.1%	4.7%
vs. MSCI World	8.4%	11.4%	0.6%	-2.3%	4.6%	3.2%
<b>CROCI US Dividends</b>	15.2%	0.9%	16.4%	13.0%	3.5%	12.5%
vs. MSCI USA High Div. Yld	7.4%	9.5%	2.6%	3.7%	3.0%	4.6%
vs. S&P 500	6.7%	12.3%	3.2%	-4.0%	2.3%	3.5%
<b>CROCI Global Dividends</b>	20.3%	-2.0%	11.2%	4.9%	6.4%	9.8%
vs. MSCI World High Div. Yld	5.4%	11.1%	2.6%	-2.3%	4.4%	3.3%
vs. MSCI World	7.1%	10.2%	1.3%	-8.4%	5.7%	3.3%
<b>CROCI Sectors Plus*</b>	23.4%	-4.0%	12.5%	13.7%	8.0%	11.9%
vs. MSCI World Value	9.9%	9.1%	3.8%	6.7%	5.9%	6.2%
vs. MSCI World	9.0%	8.2%	2.7%	0.4%	7.4%	4.3%

Source: DWS CROCI, Bloomberg Finance LP; Data as of 31 December 2023. The returns for CROCI World, CROCI Global Dividends and Global Sector Plus strategies are in USD terms. For other strategies, returns are in respective region's local currency. The Live Date for each of the strategies: CROCI US, CROCI Euro, CROCI Japan - 02 February 2004; CROCI World - 29 November 2010; CROCI US Dividends - 13 March 2012; CROCI Global Dividends - 15 March 2012; CROCI Sectors Plus - 18 November 2015.  
<sup>^</sup>From 31 March 2005 for CROCI Sectors Plus.

Figure 5: CROCI strategy years of outperformance and underperformance

<b>CROCI Strategy</b>	<b>Benchmark</b>	<b>Outperform Years</b>	<b>Underperform Years</b>
US	S&P 500	12	8
US Dividends	S&P 500	13	7
Euro	Euro STOXX 50	15	5
Japan	TOPIX 100	14	6
World	MSCI World	16	4
Sectors Plus	MSCI World	11	9
Global Dividends	MSCI World	13	5

Source: DWS CROCI; Data as available on 29 December 2023. Period is taken from 2004-2023.

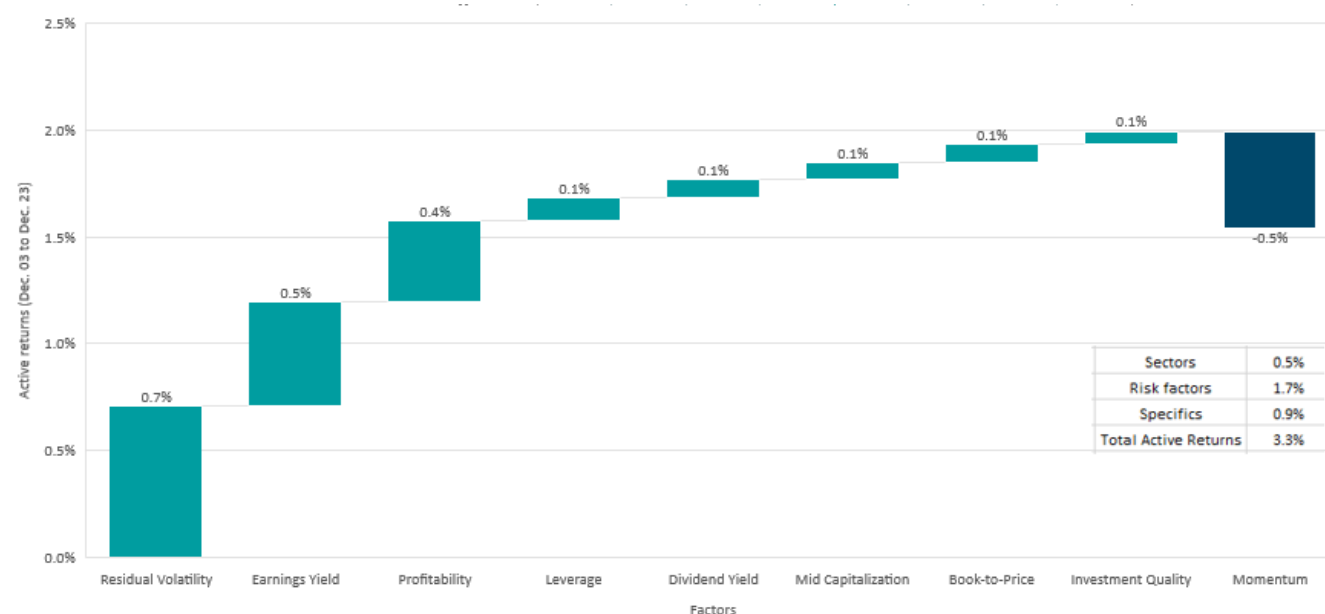
Figure 6: CROCI US vs. S&P 500 – Barra Risk factor attribution in USD, 31 Dec. 2003 - 29 Dec. 2023



Source: DWS Source: DWS, MSCI Barra, 29 Dec. 2023

The calculations presented herewith have been performed using MSCI Barra and may vary from the actual returns of the strategy due to different computational assumptions. The CROCI US Strategy is live from 02 Feb. 2004. Past performance, whether live or simulated, is not a reliable indicator of future results. All returns include reinvested dividends and do not include fees that might be charged on an investment product. All pro-forma performance data before respective live dates is simulated and was calculated by means of retroactive application of the Strategy models. It is not possible to invest directly in a strategy or index. The performance shown here is for model portfolios. The performance of any actual investment products may differ significantly. Allocations are subject to change without notice. This information is intended for informational purposes only and does not constitute investment advice, a recommendation, an offer or solicitation.

Figure 7: CROCI Japan vs. TOPIX 100 – Barra Risk factor attribution in JPY, 31 Dec. 2003 - 29 Dec. 2023



Source: DWS Source: DWS, MSCI Barra, 29 Dec. 2023

The calculations presented herewith have been performed using MSCI Barra and may vary from the actual returns of the strategy due to different computational assumptions. The CROCI Japan Strategy is live from 02 Feb. 2004. Past performance, whether live or simulated, is not a reliable indicator of future results. All returns include reinvested dividends and do not include fees that might be charged on an investment product. All pro-forma performance data before respective live dates is simulated and was calculated by means of retroactive application of the Strategy models. It is not possible to invest directly in a strategy or index. The performance shown here is for model portfolios. The performance of any actual investment products may differ significantly. Allocations are subject to change without notice. This information is intended for informational purposes only and does not constitute investment advice, a recommendation, an offer or solicitation.

Figure 8: Top 10 monthly active returns (versus broad benchmarks) for select CROCI strategies since 2004

CROCI US				CROCI Euro				CROCI Japan				
Month	Strat.	BM	Excess	Month	Strat.	BM	Excess	Month	Strat.	BM	Excess	
1	Apr-22	-3.5%	-8.7%	5.2%	Dec-08	5.3%	0.7%	4.6%	Mar-11	-3.9%	-9.0%	5.1%
2	Nov-20	15.9%	10.9%	5.0%	Apr-20	9.8%	5.3%	4.5%	Mar-09	7.2%	2.3%	5.0%
3	Jan-22	-0.4%	-5.2%	4.8%	Jun-16	-1.9%	-6.2%	4.3%	Feb-09	0.6%	-4.3%	4.9%
4	Jan-21	3.7%	-1.0%	4.8%	Jan-16	-2.6%	-6.7%	4.0%	Jan-09	-3.1%	-7.5%	4.4%
5	Feb-05	6.5%	2.0%	4.4%	Nov-10	-2.7%	-6.5%	3.8%	Sep-09	-1.3%	-5.5%	4.3%
6	Sep-17	6.1%	2.0%	4.1%	May-18	1.3%	-2.5%	3.8%	May-09	11.0%	7.2%	3.8%
7	Nov-22	9.5%	5.5%	4.0%	Jan-10	-2.8%	-6.3%	3.5%	Jan-21	3.2%	-0.2%	3.4%
8	Jan-19	11.8%	8.0%	3.9%	Apr-10	-0.5%	-3.7%	3.2%	Aug-08	-0.8%	-4.0%	3.3%
9	Jun-19	10.8%	7.0%	3.8%	Mar-13	2.8%	-0.3%	3.1%	Aug-07	-3.0%	-6.0%	3.1%
10	Jan-09	-4.8%	-8.5%	3.6%	May-08	3.6%	0.4%	3.1%	Nov-22	6.1%	3.1%	3.0%

Source: DWS CROCI, Bloomberg Finance LP; Data as of 29 December 2023.; Global strategy performance in USD terms. The three strategies have been live since 2nd February 2004. Any data from before that date is based on simulated data, applying the portfolio construction rules to historical data. BM refers to the Benchmark, which is S&P 500 for CROCI US, Stoxx 50 for CROCI Euro and TOPIX 100 for CROCI Japan.

### 1.5 Saving up for a rainy day

*“Any superior record which we might accomplish should not be expected to be evidenced by a relatively constant advantage in performance compared to the average. Rather it is likely that if such an advantage is achieved, it will be through better-than-average performance in stable or declining markets and average, or perhaps even poorer-than-average, performance in rising markets.” – Warren Buffet, Letter to the Limited Partners (1960).*

So far in this section, we have put the performance of the CROCI strategies over the past two decades into perspective. Through historical simulations, we can look back an extra decade or so to understand how performance might have looked for three of the CROCI strategies. Figure 9 shows the same analysis as Figure 8 but includes the simulation period. Figure 9 shows the resilience of CROCI strategies against the weakness in the broader markets, around the time of the TMT bubble.

We also show the performance of CROCI US, CROCI Euro and CROCI Japan, relative to their respective broad and value benchmark between 1996-2000 and 2001-2003. The total return in the period after the TMT bubble (2000-03) is significantly lower than in the run-up (1996-00). However, while CROCI strategies outperformed their benchmarks across the entire time period, in the case of CROCI US and CROCI Euro the outperformance was significantly higher during the run-off period (i.e., during market correction). This highlights an important characteristic of most value driven strategies: when market rallies are driven by euphoria, a value-driven approach tends not to materially outperform the broad benchmark. But when the market’s focus moves back to fundamentals, the environment is easier for valuation-driven strategies to outperform. This suggests that CROCI strategies managed to reduce their beta during market drawdowns.

Figure 9: Top 10 monthly active returns for selected CROCI strategies (including simulation period from 1996)

CROCI US				CROCI Euro				CROCI Japan				
Month	Strat.	BM	Excess	Month	Strat.	BM	Excess	Month	Strat.	BM	Excess	
1	Apr-99	16.1%	3.8%	12.2%	Feb-01	0.1%	-9.6%	9.7%	May-00	0.7%	-10.3%	11.0%
2	Feb-01	0.5%	-9.2%	9.7%	Sep-98	-4.6%	-10.2%	5.6%	Apr-00	5.0%	-4.0%	9.0%
3	Apr-00	6.6%	-3.0%	9.6%	Jul-00	5.2%	-0.3%	5.5%	Jul-97	9.2%	1.1%	8.2%
4	Oct-00	7.3%	-0.4%	7.8%	Mar-00	6.7%	1.3%	5.3%	Jan-00	4.2%	-2.7%	6.9%
5	Nov-00	-0.9%	-7.9%	7.0%	Oct-00	7.7%	2.9%	4.8%	Jan-97	-0.9%	-7.7%	6.9%
6	Dec-00	7.3%	0.5%	6.8%	Nov-00	-0.7%	-5.4%	4.7%	Dec-96	1.4%	-5.0%	6.3%
7	May-00	4.4%	-2.1%	6.5%	Dec-08	5.3%	0.7%	4.6%	Mar-00	7.1%	1.2%	5.9%
8	Sep-00	0.3%	-5.3%	5.6%	Apr-20	9.8%	5.3%	4.5%	May-99	1.9%	-3.7%	5.7%
9	Aug-01	-0.9%	-6.3%	5.4%	Jun-16	-1.9%	-6.2%	4.3%	Sep-97	6.0%	0.7%	5.3%
10	May-99	2.9%	-2.4%	5.3%	May-03	5.0%	1.0%	4.0%	Mar-11	-3.9%	-9.0%	5.1%

Source: DWS CROCI, Bloomberg Finance LP; Data as of 31 December 2023.; The returns for CROCI US, CROCI Euro and CROCI Japan strategies are in USD terms. The returns of all the three strategies are based on simulations, as the live date for all the three strategies is 02 February 2004. Simulation period is from 01 February 1996 to 31 December 2003. BM refers to the Benchmark, which is S&P 500 for CROCI US, Stoxx 50 for CROCI Euro and TOPIX 100 for CROCI Japan.



Figure 10: Annualised returns, selected CROCI strategies

	Run up to TMT bubble 1996-2000	Run-off from TMT bubble 2001-2003
<b>CROCI US</b>	23.8%	9.9%
vs. MSCI USA Value	8.6%	13.5%
vs. S&P 500	6.0%	14.4%
<b>CROCI Euro</b>	30.4%	-0.5%
vs. MSCI EMU Value	1.9%	10.0%
vs. STOXX 50	3.2%	14.6%
<b>CROCI Japan</b>	15.8%	-1.3%
vs. MSCI Japan Value	16.4%	3.5%
vs. TOPIX 100	17.4%	8.4%

Source: DWS CROCI, Bloomberg Finance LP; Data as of 31 December 2003. The returns for CROCI US, CROCI Euro and CROCI Japan strategies are in USD terms. The returns of all the three strategies are based on simulations, as the live date for all the three strategies is 02 February 2004. Simulation period is from 01 February 1996 to 31 December 2003.

### 1.6 Lie low during crisis period?

To test this hypothesis, we look at:

1. the beta based on a simple regression of CROCI US versus the S&P 500 since inception and specifically during the crisis period (GFC) and
2. the upside and downside capture ratios of CROCI strategies since 2004 and during the years leading up to GFC.

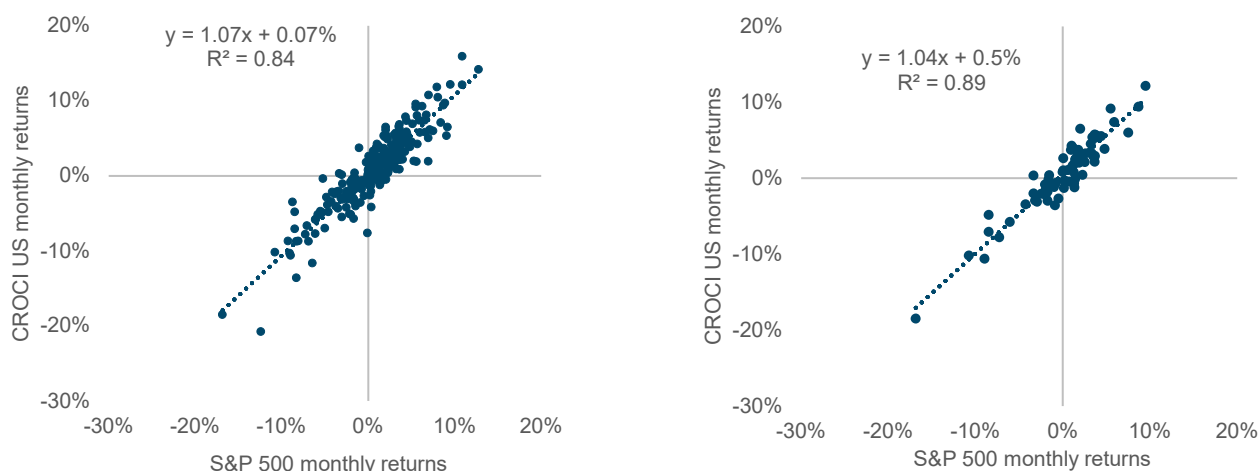
In Figure 11, we compare the linear regression of the monthly returns of the CROCI US strategy versus those of S&P 500 since 2004 and between 2004-2009. First, let us examine the period between 2004-2023. The linear regression on the LHS of this exhibit is based on 240 monthly returns, corresponding

to the past two decades. The beta is not exactly low at 1.07, while the intercept value is at 0.07%. Incidentally the corresponding beta for CROCI Euro and Japan is 0.90 and 0.94 respectively, with intercept of 0.25% each.

Focusing on the years before the GFC, the RHS chart in Figure 11 covers a period of six years. The beta goes down marginally to 1.04 but at the same time intercept or alpha goes up significantly to 0.5%. Now it is tough to draw any especially strong conclusions from just one CROCI strategy, but it is still interesting that the beta falls and the alpha rises in the period leading up to the GFC.

To help understand the other strategies, we examine capture ratios versus their respective benchmarks, between 2004-2009 and 2004-2023. Except for CROCI US and CROCI World, the downside capture ratios are significantly below 100% over 2004-2023. Across all strategies, the downside capture ratios are even better in the years leading up to the GFC. Specifically for CROCI US, the upside capture at ratio 121.90% between 2004-2009 suggests that the strategy strongly participates in the rally during this period.

Figure 11: Linear regression of CROCI US monthly returns versus S&P 500 – LHS chart: 2004-2023, RHS: 2004-2009



Source: DWS CROCI, Bloomberg Finance LP; Data as of 29 December 2023. The Live Date for each of the strategies: CROCI US - 02 February 2004. The exhibit on the left covers period between 2004-2023 and the one on the right, covers period between 2004-2009. Past performance does not predict future returns. Performance before the live date of strategies is simulated. The simulations apply an investment strategy retrospectively to data that was in part reconstructed and not necessarily available at the time. As a consequence, there may be instances when realised returns would have shown variation from those simulated and the latter may have had the advantage of hindsight. HYD stands for High Yield Dividend and HDY stands for High Dividend Yield.

At the same time, the downside capture is around 93%, showing that there was downside protection when markets turned volatile during the GFC.

In conclusion, while not all CROCI strategies appear to exhibit low beta, they tend to do well during challenging market conditions. It is also true that during the event of a market correction, the fundamental and quality aspects tend to come to the fore. As a result, phases of market turmoil have mostly proven to be periods of significant outperformance for CROCI strategies.

Figure 12: Capture ratios for selected CROCI Strategies (across the entire live period and years leading upto the GFC)

Strategy	Benchmark	2004-2023			2004-2009		
		Upside	Downside	Overall	Upside	Downside	Overall
CROCI US	S&P 500	108.6%	106.8%	101.7%	121.9%	92.9%	131.1%
CROCI Euro	Euro Stoxx 50	96.8%	84.7%	114.2%	108.5%	92.2%	117.7%
CROCI Japan	TOPIX 100	100.0%	87.8%	113.8%	98.5%	87.0%	113.3%
CROCI World	MSCI World	112.1%	100.5%	111.5%	131.1%	89.6%	146.3%
CROCI US Div.	S&P HYD Aristocrats	106.0%	80.7%	131.4%	106.0%	60.7%	174.7%
CROCI Global Div.	MSCI World HDY	107.9%	92.4%	116.8%	108.5%	75.6%	143.5%
CROCI Sectors Plus	MSCI World	103.4%	82.2%	125.8%	117.5%	81.2%	144.6%

Source: DWS CROCI, Bloomberg Finance LP; Data as of 29 December 2023. The Live Date for each of the strategies: CROCI US, CROCI Euro, CROCI Japan - 02 February 2004; CROCI World - 29 November 2010; CROCI US Dividends - 13 March 2012; CROCI Global Dividends - 15 March 2012; CROCI Sectors Plus - 18 November 2015. Past performance does not predict future returns. Performance before the live date of strategies is simulated. The simulations apply an investment strategy retrospectively to data that was in part reconstructed and not necessarily available at the time. As a consequence, there may be instances when realised returns would have shown variation from those simulated and the latter may have had the advantage of hindsight. HYD stands for High Yield Dividend and HDY stands for High Dividend Yield.

## Section II:

### CROCI's approach to holistic company analysis

## 2.1 Intuitive understanding of price to earnings

Given enough time, everyday objects, habits or words can develop a life of their own and their original meaning, provenance or usage can soon be forgotten. Think of fairy tales, frequently translated into different languages and different cultures. The story of Cinderella involves the seemingly impossible glass slippers by the time it gets to Perrault’s version – and there has long been debate whether this should have been *vair* (fur) instead of *verre* (glass).

Price-earnings ratios have also lived a life of their own since they were first made popular nearly a century ago. Today they are often taken as an indicator that tells you whether a stock is cheap or expensive—investors tend to forget that they are nothing more than a shorthand for price-to-book divided by return on equity, as well as being the reciprocal of the expected return of a stock (in the absence of growth). But the reality is that each time anyone uses the PE ratio, they take a view on both points.

## 2.2 Biggest problems in pro-forma balance sheets

The poor explanatory power of conventional valuation metrics such as PE is not evenly distributed. It tends to work better on “simple” companies or for comparing companies with similar business models and asset structures. But it breaks down for more complex companies, and particularly for comparing companies with different business models. The biggest problems are twofold: first, that there is no widespread agreement in company accounts over how to treat asset lives (even for very similar assets); second, book value does not represent a true economic entity.

## 2.3 Accounts often disagree on which asset lives to use

The price of a business can very simplistically be described as the market value of its assets after taking into consideration their obsolescence, in other words after depreciation. Put in these terms, the rate at which these assets are depreciated becomes crucial to the valuation process. Companies can take very different positions on asset lives, often depending on tax implications or other regulatory issues. One favourite example is the airline industry: very homogenous with two major suppliers in Boeing and Airbus. A quick glance at Figure 13 will make clear the disparity in assumptions about asset lives and residual value at the end of the commercial life across different airline companies. These differences can substantially impact the accounting depreciation and hence the reported earnings.

Figure 13: Global airlines asset lives

Airline	Depreciation Years	Residual Value Assumption
Air France	20 - 25	0%
Ryanair	23	15%
United Airlines	25-30	10%
Southwest Airlines	25	13-20%
ANA Holdings	9-25	0%
Cathay Pacific	20-23	1%
Singapore Airlines	12-20	0-10%
Air China	15-30	5%

Source: DWS CROCI. Data as of June 2024. Various company annual reports.

## 2.4 Equity— “Book Value”—is not an economic entity

Equity is not only distorted by the depreciation policies for tangible assets. There are many other accounting practices that can render equity values misleading, even if the worst practices such as writing down goodwill have been reined in somewhat. But if equity can be modified by accounting practice, then it is clearly not an economic metric and cannot be relied upon to estimate the economic return of assets in the company. This is made even more problematic if the company is financially leveraged, as a material part of the asset base will not be funded by equity.

For this reason, ROE is not a good indicator for share price performance, and this explains why the work that CROCI does to each company is essential for creating a meaningful PE ratio.

## 2.5 The value/return dilemma

Any work on valuation involves the comparison of a return metric with a value metric (in the context of an ambient cost of capital and a given growth rate). In other words, investors want to know what they are getting (return) for what they are paying (value) – and how that compares with alternative investments (cost of capital). The problem with price-to-book and ROE is that they are based on pro-forma accounting data which is not designed to get to the economic value assets and is therefore inappropriate for financial analysis.

Yes, there is a relationship between P/BV and ROE but it is not strong enough to be significant for meaningful stock comparisons (the average correlation over the past 20 years is an R-squared of below 0.4).

That does not mean, of course, that the sheer volume of disclosure for large-cap companies combined with rational estimates cannot be used to get to a real economic valuation metric. Even though disclosure has improved across the

globe in the past couple of decades, there is still much to be done to bring valuations into economically meaningful territory.

### 2.6 What is CROCI?

CROCI was created as an approach nearly 30 years ago with the aim of improving stock picking and portfolio management. There is very little in the way of new economic theory, but instead the focus is on breaking down silos between sectors and regions in order to make companies and metrics as comparable as possible.

The first investment strategies were created 20 years ago this year, and both the philosophy and the investment style have been very consistent over that period. The team behind CROCI has also been extremely stable. The average tenure of the CROCI management team is nearly twenty years. Similar longevity can be found in the CROCI sector specialists and investment strategy team.

The conventional PE is the most simplified form of the value/return dilemma, which means that the metric makes simplifying assumptions. P/BV and ROE work well in a world where financial leverage does not exist, where goodwill is handled consistently, where it is appropriate to depreciate assets in a linear fashion using non-standard asset lives, where no asset revaluation occurs, where intangible assets are immaterial and where there is no inflation.

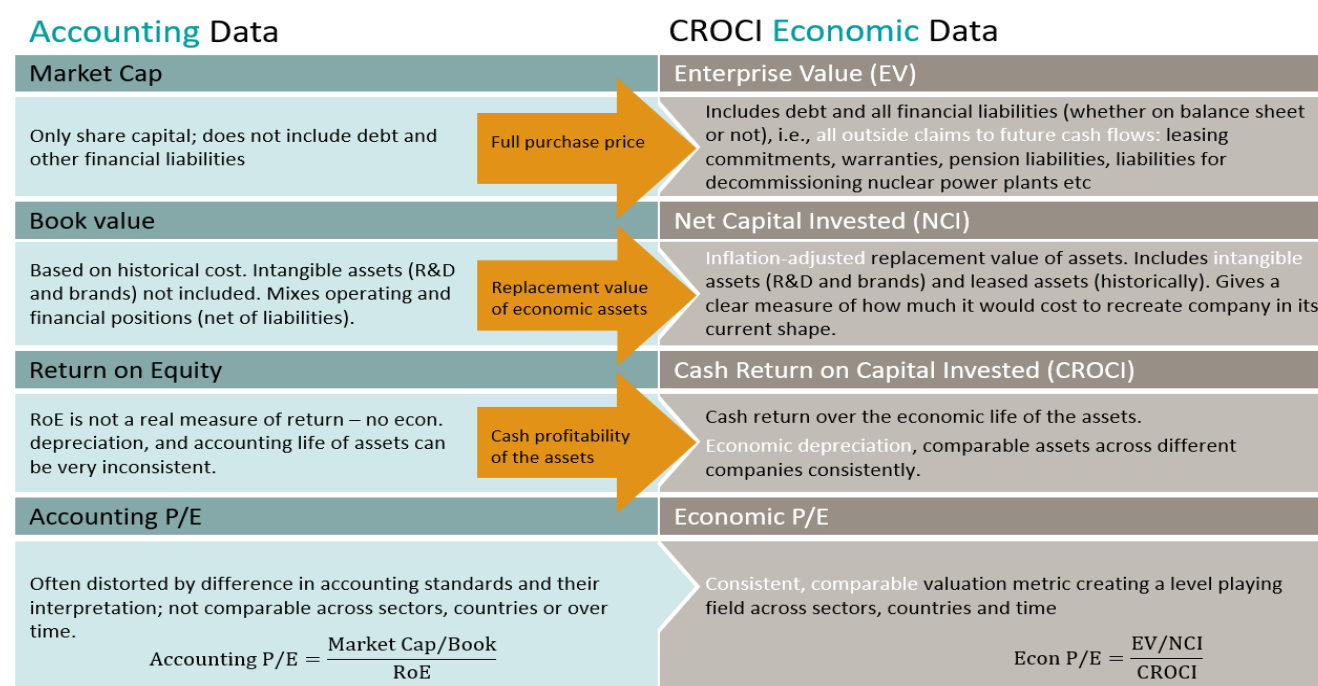
Since the world is not quite like this, financial analysts must rebuild balance sheets in a more economically meaningful way to get to a true reflection of each company's business model. That's what CROCI is all about.

Of course, each company needs to be treated on its own merits, but we can identify several high-level elements that need to be considered to transform pro-forma accounts into comparable economic metrics. We find that once we have done all this extra due diligence on every company the correlation between profitability and the asset multiple rises to an average R-squared of close to 0.75.

### 2.7 How does the CROCI process arrive at Economic PE?

Accountants have a substantial advantage over outside-in financial analysts. They are privy to virtually every piece of information within whichever company they are analysing. Much of that information is recorded in the notes to the company's financial statements. So, the raw material is to a large extent available in the accounts, but it needs to be correctly evaluated by investors. In effect that information needs to be used to rebuild each company's balance sheet and true operating cash flow in a comparable fashion. Only then can apples really be compared to apples. Using the accounting data as the starting point, to arrive at the Economic PE mentioned in the charts above, they require an economic reality check through effective adjustments. Some of the major adjustments are shown in Figure 14.

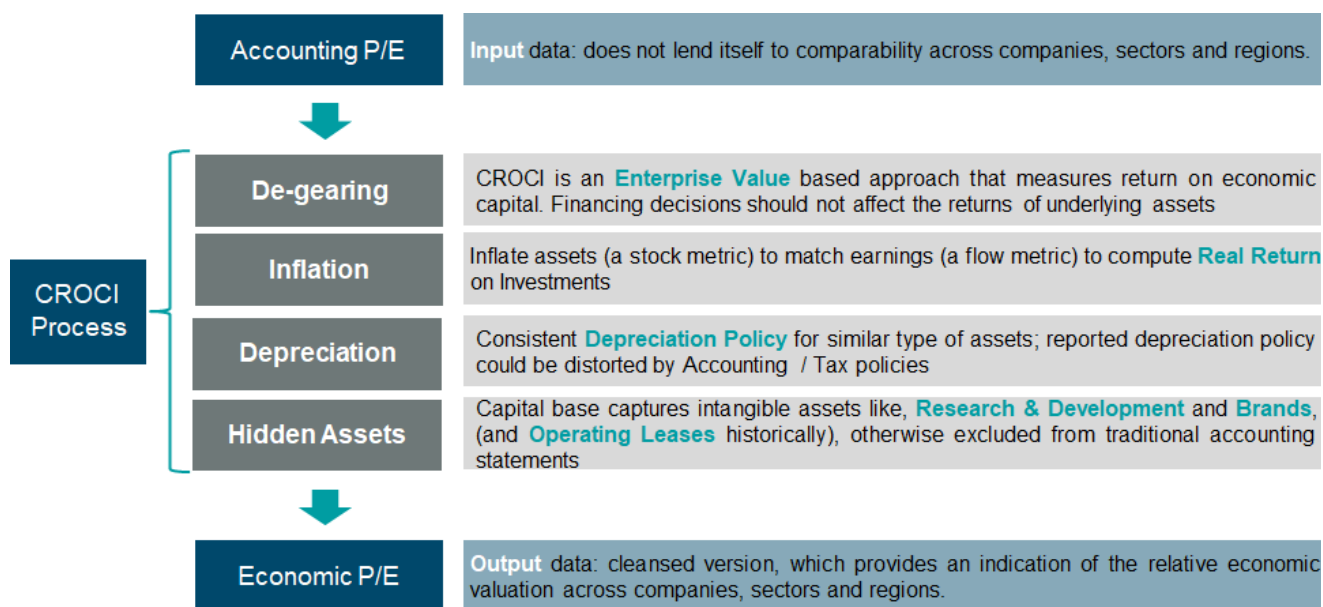
Figure 14: The CROCI process in a nutshell



Source: DWS CROCI.

2.8 The principal high-level CROCI adjustments

Figure 15: Distillation of Conventional P/E into Economic P/E

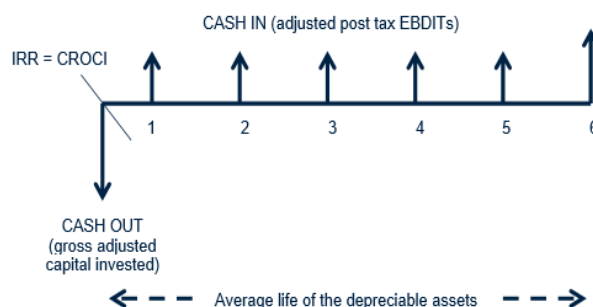


Source: DWS CROCI.

Several of the key adjustments that CROCI makes aim to present a fairer account of gross (i.e., pre-depreciation) invested capital. Investors might find this starting point surprising, given that financial markets value post-, not pre-depreciation assets. Mathematically, there is a cross-over between a model of return on asset based on gross assets and one based on net assets. In the first instance, it is assumed that assets are consumed through obsolescence. It is a model with a finite asset life and no re-investment. In the second, assets live indefinitely thanks to regular reinvestment.

We prefer to use a model based on gross assets for the very reason that accounting depreciation can be so misleading. CROCI – Cash Return on Capital Invested – is therefore the internal rate of return (IRR) equalising the gross economic value of a company’s assets with its gross cash flows in a given year, over the life of the company’s depreciable assets. It can be represented as in the following graphic.

Figure 16: CROCI IRR Calculation



Source: DWS CROCI.

The longer the asset life, the higher the cash returns, all other things being constant. But of course longer life assets often tend to come with higher asset intensity.

**Transition from Market Capitalization to Enterprise Value:** The primary objective for an investor is to identify businesses with highest possible return on capital at the lowest possible price. The issue with Accounting PE is that it ignores the fact that capital can take multiple forms (for example Equity and Debt). Debt by its very nature generally cheaper compared to Equity and is tax deductible. As a result, it is possible to infuse debt within the overall capital base and make the Accounting PE appear deceptively cheap. Let us understand with the help of an example in Figure 17. We begin the hypothetical example by looking at a zero debt business, which earns 80 in the form of after-tax earnings and

trades at a PE multiple of 15. As a result, the market capitalization of the business will be 1,200. If the same company, raises 500 in debt and would buy-back its own shares, i.e., there is no change in the enterprise value, accounting price earnings ratio should fall to 12.5x (all else being same). There is no fundamental change in the underlying business of the company that generates core cash-flows to the firm, just by buying-back shares and raising debt. Hence, financial gearing has no impact on the Economic PE.

Figure 17: Impact of financial leverage on Accounting PE

	No Financial Gearing	Financial Gearing
<b>Income Statement</b>		
Operating Earnings	100	100
Net Interest @6%	0	-30
Profit Before Tax	100	70
Tax rate @ 20%	20	14
Profit After Tax	80	56
<b>Balance Sheet</b>		
Equity Capital	1,000	500
Debt Capital	0	500
<b>Valuation</b>		
Enterprise Value	1,200	1,200
Market Capitalization	1,200	700
<b>Valuation ratios</b>		
Price to Book	1.2	1.4
<b>Accounting PE</b>	<b>15.0</b>	<b>12.5</b>
<b>Economic PE<sup>1</sup></b>	<b>15.0</b>	<b>15.0</b>
<b>Profitability ratios</b>		
Return on Equity	8.0%	11.2%
Return on Capital	8.0%	8.0%

Source: DWS CROCI. Hypothetical example: <sup>1</sup>Economic PE is calculated as Enterprise Value / Post-tax Operating Earnings.

**Inflation Adjustment:** Any return/value analysis deals with two completely different reported items: **a flow**, represented by profits, cash flow, or any measure of the earnings that have gone through the company's bank account during the reporting period (usually 12 months); and **a stock**, or the accumulated assets that the company uses to generate the flow that are generally reported on historical cost convention. Expressed in monetary terms, stock and flows are therefore not directly comparable, unless expressed in the same inflation adjusted unit.

For a Brazilian steel company, the assets base (stock value) doubles as we apply the accumulated inflation over the age of its assets. This primarily leads to change in PE from 5x (accounting) to 19x (economic).

Figure 18: Impact of Inflation on Return on Capital

Hypothetical example resembling a Brazilian Steel Company

Gross Tangible Fixed Assets	24,000
Net Tangible Fixed Assets <sup>1</sup>	8,000
Average Economic Life of assets	22.0y
Average Economic Age of assets	11.0y
Cumulative Inflation over age of assets	200%
<b>Inflation Adjusted Net Fixed Assets</b>	<b>16,000</b>
Net Profit	2,000
Return on Capital	25.0%
<b>Inflation Adjusted Return on Capital</b>	<b>12.5%</b>

Source: DWS CROCI. Hypothetical example: <sup>1</sup>Assuming a simplified Balance Sheet structure of entire Net Tangible Fixed Asset are represented by Capital.

### Case Study: the high inflation environment of the 1980s

During the high inflation of the early 1980's, regulators required companies to publish both GAAP and Inflation-adjusted financial statements<sup>2</sup>. "[The US Financial Accounting Standards Board] believes that users' understanding of the past performance of an enterprise and their ability to assess future cash flows will be severely limited until [inflation adjusted accounts are] included in financial reports"<sup>3</sup>.

Figure 19: Exxon, selected data 1982 annual report

USD mn	As reported	Adj. for inflation
Sales	103,559	103,559
Depreciation	3,333	5,929
<b>Net Income</b>	4,186	-296
Equity	28,440	69,154
<b>ROE</b>	14.7%	-0.40%
Dividend Yield	10.5%	10.5%
<b>PE Ratio</b>	<b>5.9x</b>	<b>NM</b>

Source: DWS CROCI. Exxon 1982 Annual Report: These examples are for illustrative purposes only and do not represent any investment recommendation or advice. Inflation adjustments can impact company financials in different ways, some to a greater extent than others.

<sup>2</sup> GAAP acknowledges "hyperinflation" and requires CPP accounting. However, even when inflation is low, the accumulated impact can be very distorting.

Past performance does not predict future returns. Market and index performance data is sourced from Bloomberg Finance

L.P. Company data is from the CROCI database. Unless stated this data is as of December 2023. No assurance can be given that any forecast, target or opinion will materialise. Past performance is not a reliable indicator of future returns. Forecasts are not a reliable indicator of future performance. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

<sup>3</sup> FAS33, Financial Accounting Standards Board, September 1979

Figure 20: Coca Cola, selected data 1982 annual report

USD mn	As reported	Adj. for inflation
Sales	6,250	6,250
Depreciation	<b>149</b>	<b>215</b>
<b>Net Income</b>	512	408
Equity	2,779	3,617
<b>ROE</b>	18.4%	11.2%
Dividend Yield	6.6%	6.6%
<b>PE Ratio</b>	<b>9.4x</b>	<b>11.9x</b>

Source: DWS CROCI. Coca Cola 1982 Annual Report: These examples are for illustrative purposes only and do not represent any investment recommendation or advice. Inflation adjustments can impact company financials in different ways, some to a greater extent than others.

- One would prefer Exxon over Coca Cola given lower conventional PE multiple and reasonably good ROE (14.7%); based on reported financial statements.
- However, in reality inflation was overstating profitability and thereby understating valuation for Exxon. Inflation had less of an impact on Coca Cola because of its low capital intensity.

The way that CROCI determines the correct inflation adjustment is through an estimate of the economic asset age of each company. For a company in steady state with no investment cycle (implying that a company replaces assets as soon as they become obsolete) and no growth, the average age of its assets should equal half its economic life.

Figure 21: Age Calculation for a No-Growth Company

Gross Assets	40
<b>Economic Life</b>	<b>4 years</b>
Scrapping	10 (= 40 / 4)
Capex	10
Annual Depreciation	10
Accumulated Depreciation	20
$(2.5 \times 3.5\text{yrs}) + (2.5 \times 2.5\text{yrs}) + (2.5 \times 1.5\text{yrs}) + (2.5 \times 0.5\text{yrs})$	
Net assets	20
<b>Age</b>	<b>2 years = (40-20)/10</b>

Source: DWS CROCI. Hypothetical example.

Since growth in capital invested will reduce the average age of assets, growth-adjusted accumulated depreciation divided by current depreciation is a reliable proxy for average age, provided a company depreciates asset linearly.

CROCI inflates assets according to their average age, normally using the accumulated GDP deflator of the functional currency<sup>4</sup>. There is an implicit assumption in this that, over time, currencies will adjust according to the purchasing power parity (PPP) theory. Whilst we agree that this is a simplification of a rather thorny economic question, it remains that even in this simplified version, inflation adjustment is unavoidable in reconciling the two parts of the value-return relationship.

### Depreciation Adjustment Economic Life vs Accounting Life

Along with inflation, depreciation has the most distorting influence on the calculation of financial ratios. It will distort the return metrics when they are calculated from net assets (which is almost always the case), and of course the asset multiple itself. Accounting lives, from which depreciation charges are calculated, often have little to do with economic lives. As we saw earlier, the airline sector is an especially interesting example given how homogenous it is, with similar fleet sourced from two principal providers (Boeing and Airbus). With no clear consensus on fleet asset life in such a comparable sector, comparing across the sector requires careful consideration: this is a stark example of how CROCI's adjustments are sometimes required to create a level playing field even within a sector (and the effect becomes even more pronounced across different sectors).

In addition, companies can choose to depreciate assets in various ways, either linearly, or with accelerated depreciation (declining balance method). Unfortunately, none of these methods is meant to measure the economic decay of the assets. Therefore, we choose to calculate the return (i.e. CROCI = cash return on capital invested) on a gross—i.e., pre-depreciation—basis.

As an example, a Japanese infrastructure construction company gives the following explanation for its depreciation policy,

*“Depreciation is calculated primarily using starting-line-method for buildings acquired since 2016 and declining balance method for other assets over estimated useful life. Estimates of useful lives are based on Corporate Tax Code of Japan.”*

As a result, based on accounting depreciation, the life of assets comes to around 32 years while for CROCI calculation we measure the economic life of the same assets as 12 years.

Thus, while it is straightforward to calculate asset life as implied by the accounts (the ratio of depreciable gross assets

<sup>4</sup> Where a company has assets generating cash flows in scattered geographies such as oil or mining companies, a geographically adjusted GDP deflator is used.



to the current depreciation charge), it is prone to all the variations mentioned above. The CROCI solution is to estimate a genuine economic life for every company from first principles, based on the underlying assets owned by the company and with a standardised assumption about each asset's useful life (so that comparable buildings are treated the same way, as are heavy plant or IT equipment for example).

Figure 22: Typology of economic asset lives

Type of business	Sector examples	Economic Lives
Assembling	Automotive, Engineering	9-12 years
Light transformation	Pharmaceuticals, Food	10-13 years
Heavy transformation	Steel, Pulp & Paper, Breweries	17-25 years
Real Estate-based	Hotel & Restaurants, Retail	10-30 years <sup>5</sup>
Infrastructure	Utilities	30-40 years <sup>6</sup>
Services		4-7 years

Source: DWS CROCI.

For highly capital-intensive businesses with large individual facilities where detailed information is available for each, such as mining or utilities, the useful life of each unit (mine or power plant, say) can be evaluated separately and weighted accordingly.

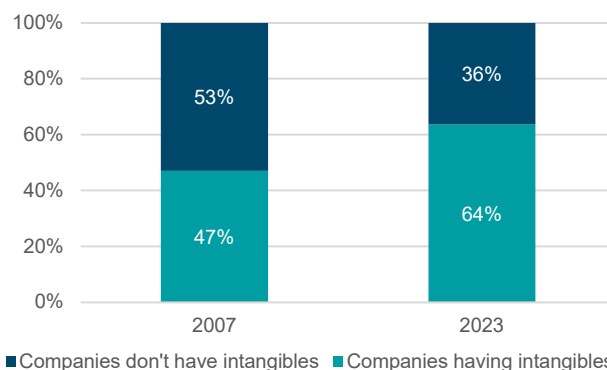
**Capitalising intangible assets:** Ideas have always contributed to economic growth, but in the past the relationship between the idea and economic growth manifested itself through hard assets. Think of railways, shipping, large chemical and steel plants, auto manufacturers. The economics of an idea required significant investment in plant and machinery, as well as needing a substantial amount of labour. Over the past decade or two, though, economic growth and equity returns have been driven by companies with apparently little capital and labour. This is a function of technological change. Many tasks previously performed by people can now be performed by robots and computers. The internet has been able to replace physical markets as a platform for exchanging goods and services. Even so, it is not true to claim that there is no capital at play. A great deal of intangible capital is employed in such businesses, the result of investment in R&D and, in some cases, advertising. However, it is important to bear in mind that advertising should only be considered as an intangible asset if it genuinely contributes to the sales of future years. In simple words, advertising must translate into brand names to

become the dividing line between success and mediocrity, and having a well-recognized brand name must contribute to growth and profitability.

The basic mission of book-keeping is to inform and protect creditors by giving them a conservative view of the value of those assets left in the company, should the company default. It follows that if accountants are unsure about the value of certain assets and cannot estimate it with accuracy, or if these assets are not fully paid for by the company, they will almost certainly exclude them from the capital base. These considerations are largely (perhaps not entirely) irrelevant to the financial analyst.

Ultimately, accounting standards typically treat expenditure on intangible assets as an operating expense, which suggests that it will only contribute to the current year's sales. But in the case of almost all research & development and brands, there is a life of more than one year. Thus, CROCI instead treats it as a capital expenditure where it makes more sense to do so. If capital is economically employed, it must make up part of the capital base against which profits are assessed. CROCI systematically capitalises expenditure on the development of such assets. Nearly half of the companies under CROCI coverage have either research & development or brands, and our research suggests that these companies account for around two-thirds of the global economic earnings, versus only half prior to the Global Financial Crisis.

Figure 23: CROCI Economic Earnings



Source: DWS, CROCI. Data as on 25 June 2023.

Capitalising intangibles is a simple exercise in principle, as it is nothing but creating a stock of synthetic assets by systematically capitalising an amount of intangible "cost-investments" over a given economic life. The table shows how various sectors use invisible capital, and its economic importance has been growing rapidly over the past decade or more.

<sup>5</sup> Depending on the constituents: for example, if it is a leasehold improvement then it could be as low as 10 years, whereas for the building itself it would be 30 years (including secondary work). A leased building can vary a lot from country to the country.

<sup>6</sup> Telco infrastructure can be much lower: 10 years for mobile and 20 years or less for fixed line.

Figure 24: Estimated Economic Life of Intangible Assets

Sector	Economic Life	Median spent as % of sales
Pharmaceuticals	10 to 15 years	19.2%
Chemical	5 to 7 years	4.4%
Consumer Goods	6 to 9 years	8.3%
Automotive	5 to 7 years	4.4%
Engineering	4 to 7 years	3.1%
Technology	4 to 5 years	12.0%

Source: DWS CROCI.

In practice, CROCI accumulates intangible costs, as reported by the company or as estimated, if necessary, over their estimated economic lives, and let the replacement cycle renew the stock of intangibles in the same way as new capex would replace an old plant or piece of equipment. Being now akin to a capex item, intangible costs no longer appear in the profit and loss account (the depreciation of the stock of intangibles does, however).

Estimation of the asset life of an intangible asset is done on a company-by-company basis and naturally depends on the business model of the company. It is worth pointing out that there are certain companies whose business models include marketing or advertising which does not create meaningful brand assets, in CROCI's view. Most obviously, this includes consumer electronics companies whose real brand value rests entirely on the cutting edge of their research. Examples of companies whose perceived brand collapsed after an ability to renew their R&D successfully include Sony in the post-Discman era of MP3 players or Nokia / Blackberry at the advent of the smartphone era. Other examples of situations where we capitalise R&D but no brands include the Autos sector.

There is also advertising in certain sectors that we generally tend not to capitalise because it does not lead to a genuine brand asset. Examples include supermarkets or hotel chains, where location and convenience tend to be more important than any brand value.

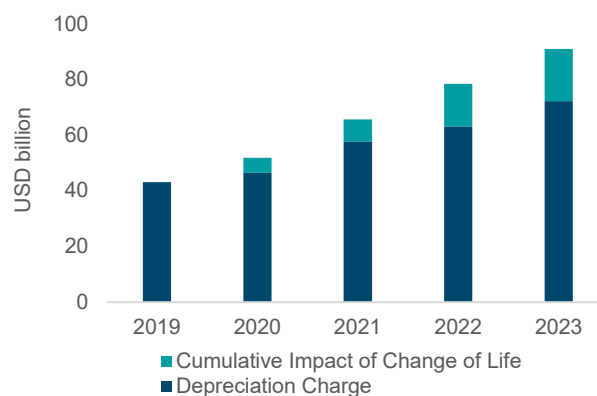
### Live examples of company intangible expenditure

#### 1) Tech companies

Technology companies (including the wider consumer tech, internet retail and interactive media space) already have a high intangible intensity. The fast rate of technological change and quick adoption of innovation comes with changes in the nature of assets and sometimes changes in the useful life of those assets. Take companies like Microsoft or Alphabet that run large cloud platforms and have recently extended the depreciable life of their assets, particularly

servers. Amazon also revised its useful life twice in the past four years, with management citing continuous improvements to hardware, software and data centre designs.

Figure 25: Depreciation and cumulative impact on change in life for Alphabet, Amazon and Microsoft



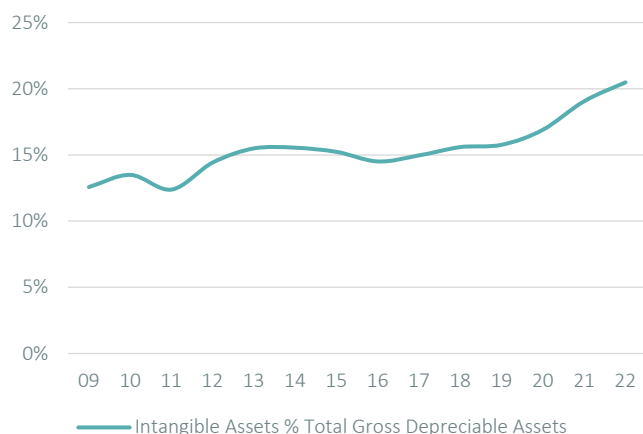
Source: DWS, CROCI. Aggregate data for Alphabet, Amazon and Microsoft for depreciation charge and cumulative impact of lower depreciation for change in the life of assets since 2019. Data as on 30-June-2024

Aggregate depreciation for three companies would have been higher by 23 per cent in 2022 had the life of assets not been revised up (Figure 25). CROCI calculates cash returns using gross capital invested, and uses a measure of asset life which is generally more consistent and more stable across companies. This allows our measure of return to be somewhat more stable than one based on reported financial statements.

#### 2) Automobile industry

Software-driven change is also revolutionizing the automobile industry, transforming every stage from design to production. Automation includes robots for welding and assembly tasks. Increasingly, the industry also employs big data analytics and AI to enable real-time monitoring of manufacturing processes, enabling faster identification of issues, and enhancing safety and efficiency across the industry. Figure 26 highlights the rising proportion of cash-generative intangible assets for European automobiles. These are mostly made up of capitalized development costs including investments made in electromobility, software and autonomous driving which have accelerated in recent years.

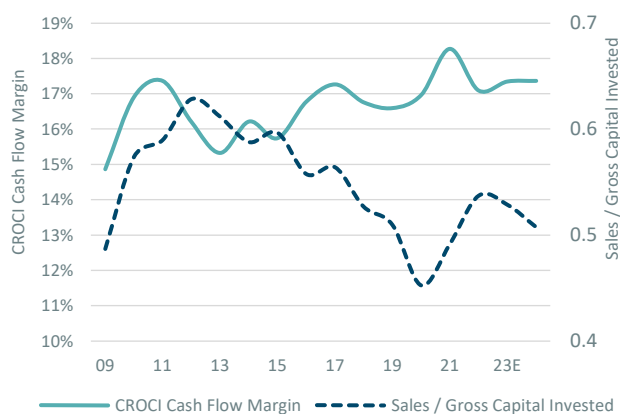
Figure 26: European Automobiles: intangible assets as percentage of Gross Depreciable Assets



Source: DWS, CROCI. Aggregate data for European Automobiles. Data as on 3-Jan-2024

However, higher spending on intangible assets tells only half the story. A real investor should feel excited only when such investments actually lead to higher productivity or higher margins or both. In the case of European automobiles, this has not really happened yet. Even ignoring the COVID-related decline, asset productivity (sales / gross capital invested) is down about 20 per cent from its 2012 peak.

Figure 27: European Automobiles: Drivers of CROCI cash return

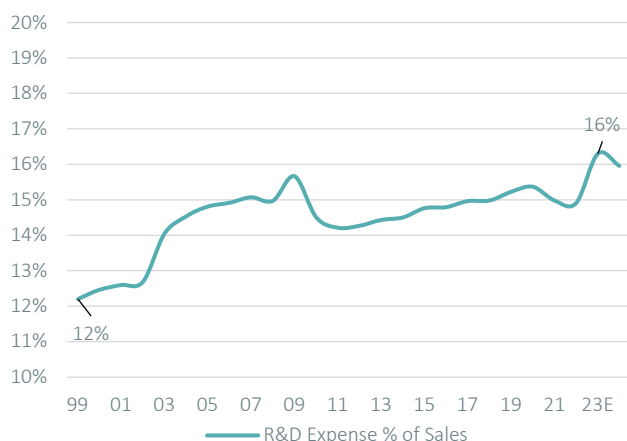


Source: DWS, CROCI. Aggregate data for European Automobiles. Data as on 3-Jan-2024

### 3) Healthcare

Healthcare is another sector where the rationale behind intangible assets is very clear. Pharma companies have the discovery and development of medical drugs at the heart of their business model. The drug discovery period (often 12 years or more) are the initial investment years before the rewards come in the patent-protected marketing period.

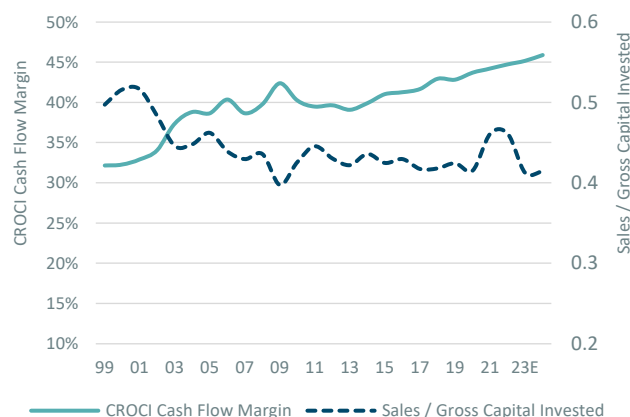
Figure 28: Global Pharmaceuticals Biotechnology & Life Sciences: R&D expense as percentage of sales



Source: DWS, CROCI. Aggregate data for Global Pharmaceuticals Biotechnology & Life Sciences. Data as on 3-Jan-2024

There is a clear trend of rising R&D spend by global pharmaceuticals and biotech companies. R&D as percentage of sales has gradually increased from 12% to around 16% over the past couple of decades (Figure 28). This is boosted by the increasing adoption of biopharmaceutical products relative to chemical drugs in last few years. At the aggregate level, we estimate that biopharmaceutical products contribute over 50% of total revenue for these companies.

Figure 29: Global Pharmaceuticals Biotechnology & Life Sciences: Drivers of CROCI cash return



Source: DWS, CROCI. Aggregate data for Global Pharmaceuticals Biotechnology & Life Sciences. Data as on 3-Jan-2024

Unlike European automobiles, global pharma exhibits a clear trend of improving profitability without any damage to asset productivity despite an increase in the capital base (Figure 29). As a result, the overall CROCI cash return for the industry has remained fairly stable and earnings have consistently improved.

The above list of adjustments is not exhaustive. However, the idea here is to not bridge the gap between accounting and economic PE to absolute precision. It is simply to make the reader understand that accounting data are at best only an aid to business evaluation, never a substitute for it.

### 2.9 CROCI: Creating a level-playing field

The broad CROCI adjustments discussed above help in arriving at CROCI Economic PE, which, unlike conventional PE, focuses on creating a level playing field for earnings regardless of the underlying business or industry.

Before we look at specific examples of the impact of these adjustments, it may be useful to understand the distribution of the accounting PE and economic PE for all the companies under CROCI coverage.

The median accounting PE of the coverage universe stood at **17.3x**, versus the median economic PE at **30.8x**. While Economic PE tends to push up the valuation in general, they are also more widely dispersed compared to the conventional PE. This reflects in the slightly more pronounced hump in the distribution curve for accounting PE relative to the economic PE.

We now look at few company examples, where the CROCI adjustments result in economic value significantly diverging from the accounting value. We have considered one company from each of the major DMs. One can look at the appendix to understand the detailed fundamental adjustments made to the companies, to arrive at the economic value.

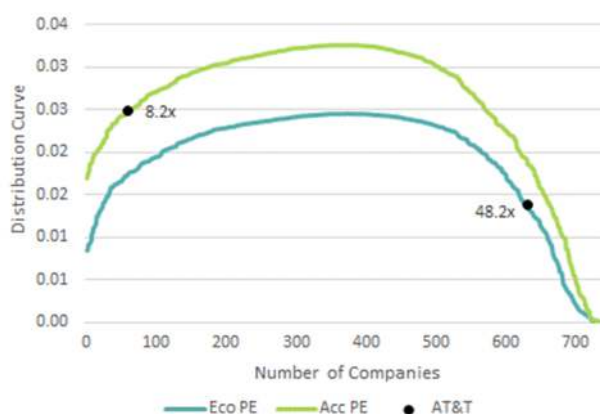
Figure 30: Company Example – High Leverage: AT&T

AT&T trades at an accounting PE of **8.2x** which makes it one of the cheapest companies within CROCI universe.

However, when its economic assets are taken into account through CROCI adjustments, its economic PE comes in at **48.2x**, as one of the more expensive in coverage.

Amongst the adjustments discussed in section 2.8, de-leveraging is the most pertinent for this company, as the enterprise value expands over two times relative to the market capitalisation.

Its accounting P/E ratio is impacted by the cost of debt funds. While the Economic P/E is measured on operating business profits, excluding the impact of financial gearing. Detailed adjustments can be seen in the appendix section.



Source: DWS CROCI, CROCI data on 10 July 2024. Distribution curves exclude companies that are negative PE or companies where PE is greater than 100 times, either on Economic or Accounting basis. Distribution curve comprises of remaining 747 companies in CROCI coverage.

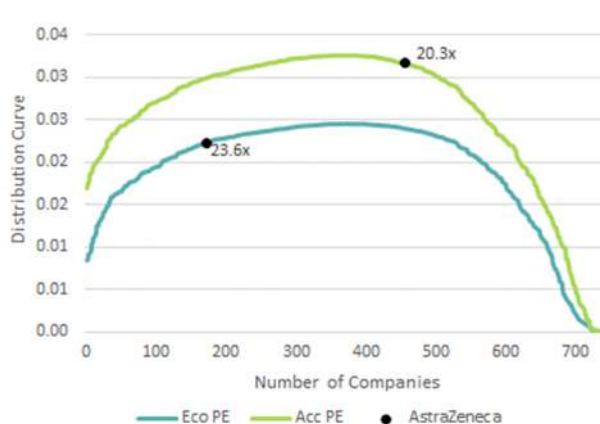
Figure 31: Company Example - Hidden Assets: AstraZeneca

AstraZeneca trades at an accounting PE of **20.3x**, about a fifth expensive than the median valuation of our coverage universe.

On being adjusted for all CROCI adjustments, its economic PE moves to **23.6x**, little over a fifth cheaper than the median economic PE for our coverage universe.

Amongst the adjustments discussed in section 2.8, this company underlines the hidden assets or capitalisation of investments expected to drive future revenues.

On average company spends almost 22% of the revenue as research cost, which is expensed to arrive at GAAP earnings. Detailed adjustments can be seen in the appendix section.



Source: DWS CROCI, CROCI data on 10 July 2024. Distribution curves exclude companies that are negative PE or companies where PE is greater than 100 times, either on Economic or Accounting basis. Distribution curve comprises of remaining 747 companies in CROCI coverage.

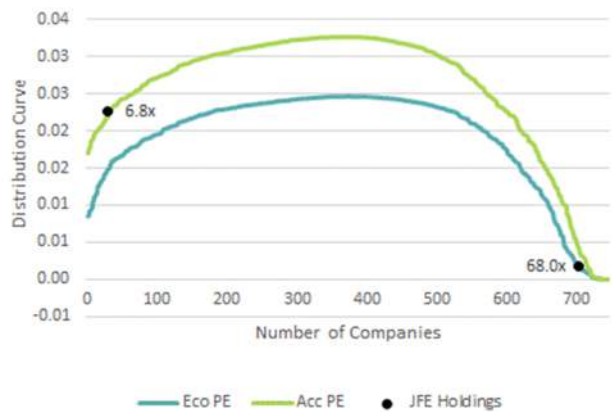
Figure 32: Company Example of Depreciation adjustment: JFE Holdings

JFE trades at an accounting PE of **6.8x**, about three-fifth cheaper than the median accounting PE for CROCI coverage.

On being adjusted for all CROCI adjustments, its economic PE moves to **68.0x**, making it amongst the most expensive companies on an economic PE basis.

The company used declining methods of depreciation till recently (2015) which could be one of the key drivers for accounting depreciation to diverge from economic depreciation.

This divergence can be observed in the accounting life of 26 years, 5 years greater than CROCI's estimate of the economic life at 21 years. Detailed adjustments can be seen in the appendix section.

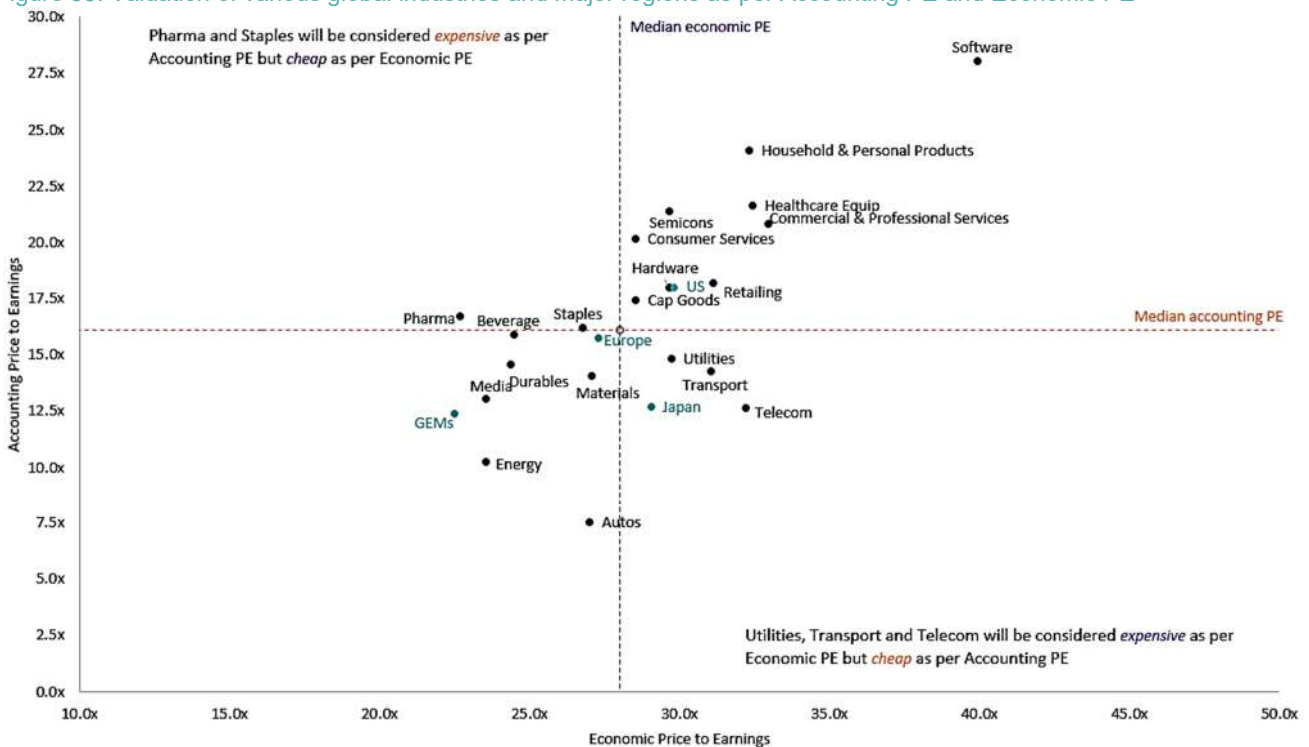


Source: DWS CROCI, CROI data on 10 July 2024. Distribution curves exclude companies that are negative PE or companies where PE is greater than 100 times, either on Economic or Accounting basis. Distribution curve comprises of remaining 747 companies in CROCI coverage.

Having looked at company specific examples, below, we plot median accounting PE against the corresponding economic PE for twenty non-financial industries. Eight have valuations below the median using conventional PE. However, three of these looks expensive on economic PE. By contrast, of the eight industries that appear cheap on economic PE, two look borderline expensive on conventional PE.

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Figure 33: Valuation of various global industries and major regions as per Accounting PE and Economic PE



Source: DWS, CROI. Data as on 14 June 2024. The dot points indicate the median valuation as measured by 2024 Economic PE and Accounting PE of the industries based on CROCI coverage (ex-financials). US – United States, GEMS – Global Emerging Markets. The median values in this chart may not tally with the ones earlier, because: 1) the calculation of the distribution curves entail exclusion of the companies that are negative PE or companies where PE is greater than 100 times, either on Economic or Accounting basis and 2) correspond to different sourcing dates.

### Epilogue: The Cost of Capital

Throughout this report, the concept of the cost of capital has been omnipresent yet undefined. The traditional measure using total return theory and the capital asset pricing model is of limited interest for valuing equities at a given point in our opinion. Even assuming that the data to calculate this is reliable across all regions, knowing an average historical cost of capital is of little help to assess the value of equities today.

Historical evidence certainly points towards strong mean reversion around a long-term average number, but recognising this acknowledges that at a given point the cost of capital can be substantially above or below the average. Of course, the long-term average is a valuable reference point for looking at the discount rate in a historical context.

The spot cost of capital is of more practical use for equity investors. The ex-ante market implied cost of capital that is used for CROCI analysis is defined as the discount rate which, at the market level, equalises the expected future cash flows with the market value of assets—or enterprise value.

By definition, this number is the expected return of equity investors in aggregate.

At the moment, this number is very low compared to history. The long-term average has been around 5.2%-5.4% over the past couple of centuries or so<sup>7</sup>. We discuss this regularly in our Outlook publications, most recently on page 13 of the CROCI Outlook 2024.

Figure 34: Long-term annual market-implied cost of capital



Source: DWS, CROCI. Aggregate of companies in CROCI's global non-financial coverage. Data as available on 03 January 2024.

<sup>7</sup> See "What Risk Premium Is Normal", Arnott & Bernstein (2002); this suggests that equity risk premium has been a little under 2.4%. Past performance does not predict future returns. Market and index performance data is sourced from Bloomberg Finance L.P. Company data is from the CROCI database. Unless stated this data is as of December 2023. No assurance can be given that any forecast, target or opinion will materialise. Past performance is not a reliable indicator of future returns. Forecasts are not a reliable indicator of future performance. Forecasts are based on assumptions, estimates, views and hypothetical models or analyses, which might prove inaccurate or incorrect.

measured since 1810. Over that period there has been a strong mean reversion of the risk-free rate to around 3% in real terms.

## Section III:

### Putting the CROCI philosophy to work

### 3.1 Building investment strategies without emotion

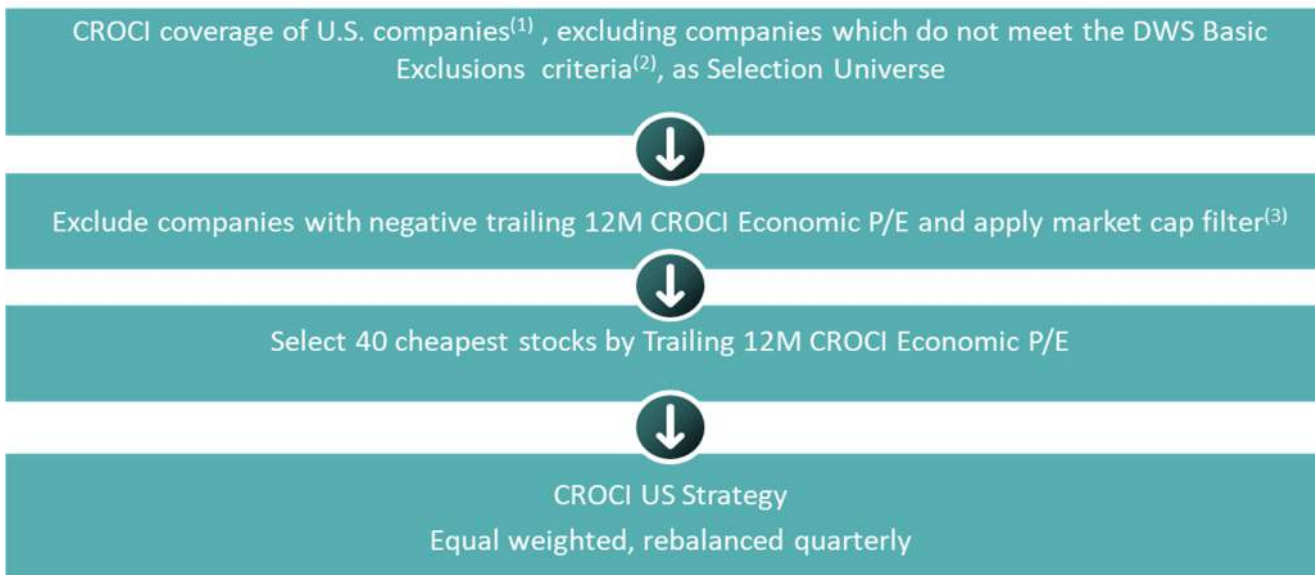
Typically, a value approach suggests holding stocks with low conventional PE ratios or high dividend yields. Unfortunately, such signals are not reliable for determining whether stocks are as cheap as they seem. Equally, a high conventional PE ratio is not inconsistent with a genuine value stock (we can see examples of both in [section 2.9](#)). Having put all the hard work previously described in this section into arriving at truly comparable company data, we now have the luxury of being able to build portfolios in a simple and transparent manner.

Portfolio construction of all the CROCI strategies is driven by clearly defined and documented rules. As a result, the investment strategies are shielded from the influence of an individual's opinions or views and instead driven by the conviction that markets will eventually discover intrinsic value of companies (which the CROCI company analysis process described in this section seeks to identify) and this will ultimately drive the portfolio performance.

In [Figure 35](#), we provide an illustration of how we arrive at an investment strategy. We use a strategy named CROCI US for this example, which is amongst the oldest strategies run by the CROCI team (live since Feb 2004). Staying true to the principles of identifying economic value, this strategy selects the 40 cheapest businesses by trailing twelve months Economic PE, after running some adjustments highlighted in the exhibit below. All the companies identified as the cheapest on Economic PE are given equal weights and the strategy is rebalanced on a quarterly basis, to take care of any fluctuations in the quotational price and/or underlying fundamentals of the businesses.

In summary, all CROCI investment products are not impacted by views of any individual analyst. They are clearly defined by rules that uses Economic PE as one of the most important factors in arriving at portfolio composition.

Figure 35: Illustration of the building blocks of the CROCI US Investment Strategy



Source: DWS CROCI. <sup>(1)</sup> Only companies in CROCI coverage are considered but excluding the companies from the Financials and Real estate sectors. <sup>(2)</sup> Effective 01 January 2022, the Strategy incorporated environmental, social and governance (ESG) characteristics based on DWS Basic Exclusions, a DWS proprietary ESG assessment methodology, provided by DWS ESG Engine. <sup>(3)</sup> Exclude companies with low market capitalization.



Figure 36: CROCI in summary – Harmonising balance sheets and true cash flows allow portfolios to be entirely fundamental and bottom-up



Source: DWS, CROCI.

### 3.2 Systematic active –best of both worlds

CROCI follows a rules-based portfolio construction strategy, which largely eliminates style drift or key individual risk. Even so, CROCI strategies tend to be high concentration and high conviction. They exhibit high active share and tracking error, with the aim of generating significant alpha. Figure 36 breaks down the key building blocks behind the CROCI philosophy, which has been a driver of the solid outperformance of the CROCI strategies. The key message we intend to have the reader take away from the exhibit is that CROCI investment strategies are not “quant” or “multi-factor”. At the heart of everything, the CROCI philosophy is simply to answer the two most fundamental questions for any investor: 1) how much capital do I provide and 2) what return do I receive.

(formerly known as CROCI Intellectual Capital), which gives exposure to companies that are growth oriented by applying filters that focuses on companies with intangible assets (Research & Development or Brands).

### 3.3 Thematic strategies based on the CROCI philosophy

Identification of value stocks based on Economic PE is the bedrock of the longest running CROCI investment strategies. Some strategies are more thematic in nature, such as the dividend-oriented strategies. The focus here is on sustainability of dividends, by overlaying quality factors like high cash returns, low financial leverage and low price volatility—on the overall high dividend paying companies. Another example is the CROCI Innovation Leaders strategy

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# Appendix

Example 1: Illustration of the CROCI adjustments on the conventional numbers of AT&T

Price		Assets			Return		Valuation	
Market Cap	134,488	BV: Book Value (Shareholder's Equity cum Goodwill)		116,390	Return on Equity	14.1%	P/E	8.2
CROCI Enterprise Value	323,565	NCI: CROCI Net Capital Invested ex Goodwill		388,523	CROCI	1.7%	Ec. P/E	48.2
		Shareholder's Equity ex Goodwill		43,424				

EV Components		Gross Assets Components			IRR		Breakdown		
Total Market Cap	134,488	Gross Tangible Fixed Assets	386,036	84,516	470,552	CROCI Cash Flows	42,617	P/BV	EV/NCI
★Dilutive Securities	-	of which depreciable TFA	378,969	82,969	461,938	CROCI Gross Capital Invested	614,544	1.2	0.8
★Op Lease Commitments	-	Gross Intangible Fixed Assets	-	-	-	★Economic Life (yrs)	13		
★Net Debt	150,188	Other Long Term Assets	142,033	-	142,033	CROCI	1.7%		
★MV of Minorities	10,200	Net Working Capital	(4,757)	6,715	1,958				
★MV of Participations	(1,251)	Participations & Min. -(Net Debt+Other Liab)	(243,146)	243,146	-				
★Pension & Retirement	8,892	★Gross Leasing	-	-	-				
★Def Revs/AdvPmt/Warmt	6,715	★Gross Capitalised Intangibles	-	-	-				
★Other Liabilities	14,333	of which acquired as Goodwill	-	-	-				
Enterprise Value	323,565	Other			(0)				
		Assets net of liab., gross of deprec.	280,166	334,378	614,544				
		Super Goodwill (not capitalised as intangibles)	72,966	59,144	132,110				
		Gross Assets cum Goodwill	353,132	393,522	746,654				

★ denotes CROCI adjustments		Depreciation Components			
2.4		Depreciation of Tangible Fixed Assets	236,742		226,020
		Balance Sheet Intangible Fixed Assets	-		-
		★Leasing	-		-
		★Capitalised Intangibles	-		-
		Other			(0)
		Total Depreciation	236,742		226,020
		Total Net Assets ex Goodwill	43,424		388,523
		Super Goodwill	72,966		132,110
		Total Net Assets cum Goodwill	116,390		520,633

Income Components		Quintile	
Adj. Net Profit (Post Min.)	16,356	P/E	Ec. P/E
★Participations & Minorities	(1,550)		
★(Taxed) Interest	5,951		
★Inflation (adj. of depreciation)	(5,473)		
★Contrib. of Econ. vs Acc. Life	(6,371)		
nb: Accounting Life (yrs)	16		
★Others: Leasing, Intgbls, GW, IRR	(2,198)		
Econ. Earnings (= CROCI x NCI)	6,714		

- A. Adjustment of \$168 billion of debt and other debt type liabilities to arrive at the Enterprise value. This does not get captured in the conventional P/E, which focusses on the market capitalisation of the company.
- B. Accounting P/E ratio tend to be impacted by the cost of debt funds. On the other hand, Economic P/E is measured on operating business profits, excluding the impact of financial gearing.

Source: DWS, CROCI, the numbers correspond to FY1 of the company, as of 10 Jul. 2024

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Example 2: Illustration of the CROCI adjustments on the conventional numbers of AstraZeneca

Price		Assets			Return		Valuation		
					Accounting Currency: USD				
Market Cap	242,716	BV: Book Value (Shareholder's Equity cum Goodwill)		43,568	Return on Equity	27.5%	P/E	20.3	
CROCI Enterprise Value	267,244	NCI: CROCI Net Capital Invested ex Goodwill		66,185	CROCI	17.1%	Ec. P/E	23.6	
		Shareholder's Equity ex Goodwill		(10,284)					
<b>EV Components</b>		<b>Gross Assets Components</b>			<b>IRR</b>		<b>Breakdown</b>		
Total Market Cap	242,716	Gross Tangible Fixed Assets	21,094	5,108	26,202	CROCI Cash Flows	24,790	P/BV	EV/NCI
★ Dilutive Securities	-	of which depreciable TFA	18,308	4,434	22,742	CROCI Gross Capital Invested	124,263	5.6	4.0
★ Op Lease Commitments	-	Gross Intangible Fixed Assets	7,184	1,740	8,924	★ Economic Life (yrs)	12	<b>Quintile</b>	
★ Net Debt	18,795	Other Long Term Assets	4,132	-	4,132	CROCI	17.1%	P/E	Ec. P/E
★ MV of Minorities	23	Net Working Capital	(906)	258	(648)			Cheap	
★ MV of Participations	(1,681)	Participations & Min. -(Net Debt+Other Liab)	(25,141)	25,141	-			Expensive	
★ Pension & Retirement	1,000	★ Gross Leasing	-	-	-	<b>Income Components</b>			
★ Def Revs/Adv/Pmt/Warrnt	258	★ Gross Capitalised Intangibles	-	85,652	85,652	Adj. Net Profit (Post Min.)	11,973		✓
★ Other Liabilities	6,134	of which acquired as Goodwill	-	85,652	-	★ Participations & Minorities	22		✗
Enterprise Value	267,244	Other			(0)	★ (Taxed) Interest	662		
		Assets net of liab., gross of deprec.	6,364	117,899	124,263	★ Inflation (adj. of depreciation)	(333)		
		Super Goodwill (not capitalised as intangibles)	53,852	11,226	65,078	★ Contrib. of Econ. vs Acc. Life	(397)		
		Gross Assets cum Goodwill	60,215	129,125	189,341	nb: Accounting Life (yrs)	15		
						★ Others: Leasing, Intgbls, GW, IRR	(616)		
						Econ. Earnings (= CROCI x NCI)	11,311		
★ denotes CROCI adjustments		<b>Depreciation Components</b>							
		1.1 Depreciation of Tangible Fixed Assets	9,523		11,258				
		Balance Sheet Intangible Fixed Assets	7,124		4,418				
		★ Leasing	-		-				
		★ Capitalised Intangibles	-		42,402				
		Other			(0)				
		Total Depreciation	16,648		58,078				
		Total Net Assets ex Goodwill	(10,284)		66,185				
		Super Goodwill	53,852		65,078				
		Total Net Assets cum Goodwill	43,568		131,263				

- A. Nearly \$86 billion of gross capitalised assets becomes adjusted in the gross assets of the company, to arrive at the real capital base. On average, this company spends almost 22% of the revenue as research cost, which is expensed to arrive at GAAP earnings.
- B. The real return on capital remains significantly high in the mid-teens (17.1%), driving the overall valuation to be attractive relative to the median company.

Source: DWS, CROCI, the numbers correspond to FY1 of the company, as of 10 Jul. 2024

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Example 3: Illustration of the CROCI adjustments on the conventional numbers of JFE Holdings

Price		Assets			Return		Valuation	
Market Cap	1,496	BV: Book Value (Shareholder's Equity cum Goodwill)		2,625	Return on Equity	8.4%	P/E	6.8
CROCI Enterprise Value	2,578	NCI: CROCI Net Capital Invested ex Goodwill		6,004	CROCI	0.6%	Ec. P/E	68.0
		Shareholder's Equity ex Goodwill		2,609				

EV Components		Gross Assets Components			IRR		Breakdown		
Total Market Cap	1,496	Book Value	*Adj	Real Capital	CROCI Cash Flows	417	P/BV	EV/NCI	
*Dilutive Securities	-	Gross Tangible Fixed Assets	7,897	606	8,503	CROCI Gross Capital Invested	9,961	0.6	0.4
*Op Lease Commitments	-	of which depreciable TFA	7,352	565	7,917	*Economic Life (yrs)	21		
*Net Debt	1,564	Gross Intangible Fixed Assets	-	-	-	CROCI	0.6%		
*MV of Minorities	74	Other Long Term Assets	17	-	17				
*MV of Participations	(772)	Net Working Capital	1,389	52	1,441				
*Pension & Retirement	53	Participations & Min. -(Net Debt+Other Liab)	(1,034)	1,034	-				
*Def Revs/Adv/Pmt/Warmt	52	*Gross Leasing	-	-	-				
*Other Liabilities	110	*Gross Capitalised Intangibles	-	-	-				
Enterprise Value	2,578	of which acquired as Goodwill	-	-	-				
		Other			0				
		Assets net of liab., gross of deprec.	8,268	1,693	9,961				
		Super Goodwill (not capitalised as intangibles)	15	-	15				
		Gross Assets cum Goodwill	8,284	1,693	9,977				

Income Components		Quintile	
Adj. Net Profit (Post Min.)	220	P/E	Ec. P/E
*Participations & Minorities	(60)		
* (Taxed) Interest	15		
* Inflation (adj. of depreciation)	(22)		
* Contrib. of Econ. vs Acc. Life	(75)		
nb: Accounting Life (yrs)	26		
* Others: Leasing, Intgbls, GW, IRR	(41)		
Econ. Earnings (= CROCI x NCI)	38		

Depreciation Components	
1.7	Depreciation of Tangible Fixed Assets
	Balance Sheet Intangible Fixed Assets
	*Leasing
	*Capitalised Intangibles
	Other
	Total Depreciation
	Total Net Assets ex Goodwill
	Super Goodwill
	Total Net Assets cum Goodwill

★ denotes CROCI adjustments	
	1.7

- A. Adjustment of JPY 920 billion of debt and other debt type liabilities to arrive at the Enterprise value. This does not get captured in the conventional PE, which focusses on the market capitalisation of the company.
- B. The adjustment for contribution of Economic Life vs Accounting life, along with inflation, knocks off more than two-fifth off the conventional net profit of the company.

Source: DWS, CROCI, the numbers correspond to FY1 of the company, as of 10 Jul. 2024

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Further Information:

**CROCI Team**

[croci.valuations@dws.com](mailto:croci.valuations@dws.com)