

Investing in carbon: a new asset class

European carbon allowances - "A little goes a long way"

IN A NUTSHELL



Murray Birt
Senior ESG
Strategist

- Carbon markets are a priority at COP28¹, but allowances are not offsets. The EU Emissions Trading System (ETS) requires major companies to hold an EU Allowance (EUA) per tonne of emissions or face steep fines.
- Unlike other commodities, the EUA supply or cap falls every year, to create scarcity and a carbon price that encourages companies to cut emissions. The EU concludes² that the ETS is effective in reducing emissions.
- Policymakers have strengthened market rules: the annual cut in EUAs is now 4.3% (2.2% previously), which is likely to lead to higher prices. Market rules have reduced volatility and improved price forecast accuracy. EUA correlation with other asset classes is low but growing.



Jay Joshi
Research Analyst

- We forecast that carbon allowances could hit EUR 95 by the end of 2024. This could make EUAs one of the strongest performing asset classes in DWS's Chief Investment Office (CIO) forecasts³ from November 2023.
- The declining cap means that EUAs could disappear by 2039 with long-term price implications that will depend on the speed and cost of industrial decarbonization and policy response.



Michael Lewis
Head of ESG
Research

- Financial regulators conclude⁴: "the market appears to broadly function as expected". As investor participation grows, market monitoring is important to maintain the ETS's aim to facilitate the transition.
- DWS's CROCI[®] carbon price scenario analysis of European equities finds that the energy, utility, industrial and material sectors could face financial risks. Investing in carbon allowances could be an innovative hedge. However, carbon allowance accounting standards are needed to facilitate company level risk assessment⁵.
- Net zero portfolio guidance focuses on offsets⁶ rather than allowances. We are more cautious regarding strong claims of real carbon reductions from a buy-and-hold strategy⁷, particularly as an academic cut his estimate of potential emission reductions⁸. A price effect is possible, but more analysis is needed.
- Companies regulated by the ETS have an essential role to play in the transition, but many climate equity funds underweight these sectors. Hedging with EUAs can thus complement net zero transition engagement goals by helping address potential financial risks from remaining invested in these sectors.
- Using a Strategic Asset Allocation (SAA) model, Defensive, Balanced, & Dynamic portfolios could receive a small return enhancement (0.11% to 0.23% to 0.34%) with reduced volatility, by adding carbon with an allocation ranging from 2.1% to 4.5% to 6.75% respectively. We also examine other allocation methods.

No assurance can be given that any forecast, target, or opinion will materialize. Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

¹ UNFCCC (Nov 2023) [UN Body charts a path for robust carbon market rules ahead of COP28](#)

² EU Commission (October 2023) [Carbon market report](#)

³ DWS (November 2023) [CIO Forecasts](#)

⁴ ESMA (March 2022) [Final report on emission allowances and associated derivatives](#)

⁵ DWS CROCI (April 2023) [Carbon allowances and financial accounts: CROCI's approach and the need for an international accounting standard](#)

⁶ For instance: Net Zero Asset Owners Alliance (Sept 2023) [Use of carbon credits in climate target setting](#)

⁷ Sparkchange (November 2021) [Impact of Carbon Investing](#)

⁸ Quemin, Simon (June 2023) [Corrigendum to the note "Emission Effect of Temporary Allowance Withdrawals in the EU Emissions Trading System"](#)

The brand DWS represents DWS Group GmbH & Co. KGaA and any of its subsidiaries, such as DWS Distributors, Inc., which offers investment products, or DWS Investment Management Americas, Inc. and RREEF America L.L.C., which offer advisory services. There may be references in this document which do not yet reflect the DWS Brand. Please note certain information in this presentation constitutes forward-looking statements. Due to various risks, uncertainties and assumptions made in our analysis, actual events or results or the actual performance of the markets covered by this presentation report may differ materially from those described. The information herein reflects our current views only, is subject to change, and is not intended to be promissory or relied upon by the reader. There can be no certainty that events will turn out as we have opined herein.

For Professional Clients (MiFID Directive 2014/65/EU Annex II) only. For Qualified Investors (Art. 10 Para. 3 of the Swiss Federal Collective Investment Schemes Act (CISA)). For Qualified Clients (Israeli Regulation of Investment Advice, Investment Marketing and Portfolio Management Law 5755-1995). Outside the U.S. for Institutional investors only. In the United States and Canada, for institutional client and registered representative use only. Not for retail distribution. Further distribution of this material is strictly prohibited. In Australia and New Zealand: For Wholesale Investors only. For Asia institutional investors only. *For investors in Bermuda: This is not an offering of securities or interests in any product. Such securities may be offered or sold in Bermuda only in compliance with the provisions of the Investment Business Act of 2003 of Bermuda which regulates the sale of securities in Bermuda.

1 / EU carbon market fundamentals

Should companies be free to pollute as much as they want? Ask any economist and the answer will be a resounding no. Companies should face a price that fully includes the environmental and social cost of decisions.

Lord Nicholas Stern (lead author of the UK Treasury's *Report of the Economics of Climate Change*), Dr Joseph Stiglitz (2001 Nobel Memorial Prize in Economic Sciences), and Dr Cameron Hepburn (Director of the University of Oxford's Smith School for Enterprise and the Environment) and many other academics, have published reports showing how market efficiency, economic growth and societal well-being could be improved when the external harm caused by different types of pollution, are internalised into decision-making such as through carbon markets⁹.

This report focuses on the EU ETS, which is the world's largest carbon market, examining:

1. **EU carbon market fundamentals**
2. **Investment properties**
3. **Equity price risk from carbon and the need for international accounting rules**
4. **Portfolio allocation: Strategic Asset Allocation, industrials in climate equity indices and an 'Efficient Frontier'**
5. **Conclusion: the 'end game' for carbon post-2030 and oversight of investor participation in the ETS**

Carbon markets and Europe's Emissions Trading System

In February 2022, we published a report on "The why, what & where of carbon markets"¹⁰ covering the evolution of carbon emissions, history, and future developments of carbon markets around the world.

There are now 73 carbon tax and carbon market policies around the world, creating a price that encourages companies to cut emissions. These policies cover ~23% of global emissions, a significant increase from ten years ago when only 7% of emissions faced a price on carbon. However, for most countries, the price is far too low to encourage emission reduction¹¹.

Expanding the coverage and strength of carbon price policies is thus an objective supported by many companies and investors. Since 2009, DWS has consistently signed the Global Investor Statement on Climate Change¹², which calls for carbon pricing.

The Net Zero Asset Owner Alliance¹³ is calling on policymakers to implement ambitious and reliable carbon prices.

Acknowledgments

We would like to thank: The DWS Xtrackers Product team, particularly Sam Sadayo and Giorgio Cusma,

Virginie Galas (Head of Research, CROCI), Gyanendra Jaiswal & Venkatrami Bijjaram (CROCI analysts) for carbon price risk analysis; Janamejay Kumar & Abhishek Mittal for the [CROCI report on Carbon allowances and Financial Accounts](#),

Peter Warken (Head of SAA) and Timo Sachaz (Analyst – Multi Asset and Solutions),

Rob Bush (Research Institute)

Anastasia Manuel (Xtrackers Capital Markets)

DWS CIO Office team.

No assurance can be given that any forecast, target, or opinion will materialize. Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

⁹ For instance: Hepburn, Cameron; Joseph Stiglitz and Nicholas Stern (2020) European Economic Review: [Carbon pricing](#)

¹⁰ DWS Research Institute (February 2022). [Carbon Markets: The why, what & where](#)

¹¹ World Bank (May 2023) [Status and trends in carbon pricing](#)

¹² DWS 2009-2022. Investor Agenda (2022) [Global Investor Statement](#)

¹³ NZAOA (June 2022) [Position paper on governmental carbon pricing](#)

Europe’s “cap and trade” policy

For investors, a key factor to understand is that unlike any other market, if the price goes up, supply does not directly increase. The ETS is a ‘cap and trade’ system where the allowances decline every year to help meet climate goals, as shown in **Figure 1**.

The EU ETS¹⁴ regulates emissions from 8,757 electricity and heat plants and manufacturing installations in the EU 27 Member States (plus Iceland, Liechtenstein, Norway, Northern Ireland), as well as 371 aircraft operators flying between European Economic Area (EEA) airports, and from the EEA to Switzerland and the UK. The ETS is also linked with the UK and Swiss ETS. This represents around 36% of all EU emissions.

Since 2005, the emissions within the scope of the ETS have declined by 34.6%, showing the effectiveness of the emissions cap but also the link with other policies, such as renewable energy targets and incentives.

Starting in 2024, carbon emissions from maritime transport will be included in the ETS: 100% of emissions are covered for voyages between EU ports and 50% of emissions for voyages starting or ending outside of the EU.

The ETS has continued to evolve since its creation in 2005. Several rounds of legislation have improved its operation and effectiveness, learning from experience. A summary of the changes can be read on the Commission’s website¹⁵.

From 2020, ~57% of EUAs are sold in periodic auctions primarily through the European Energy Exchange (EEX). The ETS has generated over EUR 100 billion in revenues from auctioning carbon allowances with revenue distributed to Member States from 2013-21. In 2021, 76% of revenue raised was used for climate and energy purposes.

Carbon leakage may occur if ETS-regulated activities are moved to non-EU countries with less ambitious climate policies, thus leading to an increase in overall emissions. Based on evidence, major industrial sectors (but not all industries) are eligible for free EUAs for ‘at risk’ sectors. Sector specific benchmarks of the 10% most efficient installations in each sector, are used to distribute allowances. This ensures companies have an incentive to reduce their emissions. **Figure 2** show that the proportion of allowances being auction is growing over time.

Europe’s new carbon border tariff system is the next major policy to help protect companies from carbon leakage (explained on p. 12). Encouragingly, Carbon Border Adjustment Mechanism (CBAM) is helping encourage more countries to create or strengthen carbon markets or border tariffs including Australia, Brazil, India, Indonesia, Taiwan, Turkey, UK, and Vietnam. There are even several U.S. legislative proposals for a carbon border tariff, including from the Republicans¹⁶.

Figure 1: Fewer allowances due to the declining EU cap on emissions

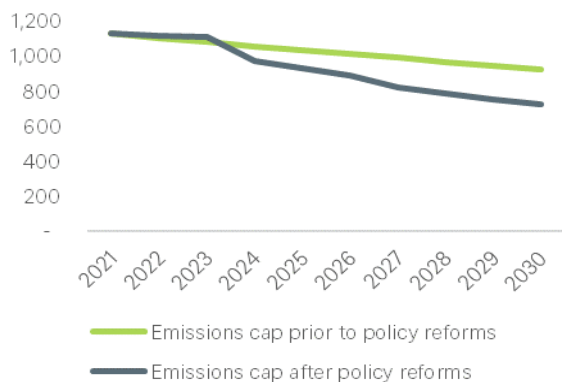
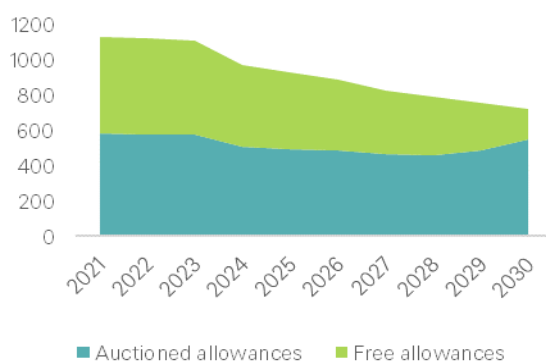


Figure 2: ‘Free’ allowances are being phased out: industrial’s demand for allowances will increase



Source: DWS analysis based European Commission (2023) European Environment Agency (2022-2023)

Source: DWS analysis based European Commission (2023) European Environment Agency (2022-2023)

No assurance can be given that any forecast, target, or opinion will materialize. Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

¹⁴ Statistics in this section of the report are taken from EU Commission (October 2023) [Carbon market report](#)

¹⁵ https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets_en

¹⁶ HSBC (October 2023) European Green Deal: CBAM country and sector impacts start to emerge.

Market Stability Reserve (MSR) – rules-based balancing of supply and demand

The MSR was created to address a problem that arose during Phase 2 (2008-12). The emissions cap was set with an assumption of 2.5% GDP growth. After the financial crisis and lower economic growth, there was a surplus of 2.1 bn allowances which led to a significant ETS price decline. To address this problem, the EU Commission delayed the auctioning of 900m allowances from 2014-16 to 2019-2020.

A more long-term solution was to use legislation to create the MSR in 2015. In 2019, the MSR started adjusting the volume of auctioned allowances based on a pre-defined Total Number of Allowances in Circulation (TNAC). The MSR has helped balance supply and demand for EUAs, including through the covid-19 pandemic when economic activity and emissions fell sharply. There is no discretion from the European Commission or EU Member States in the MSR's implementation. The Commission's review of the MSR in 2021 found that it has functioned well, helping provide a robust carbon price signal even when there are demand shocks such as the pandemic¹⁷.

We believe the functioning of the MSR and the reduction in surplus allowances, is one of the key reasons for the increase in the ETS carbon price and the reduction in volatility as discussed below.

2 / Investment properties of carbon allowances

This section of the report examines:

- i. Volatility
- ii. Correlation with major asset classes
- iii. Liquidity
- iv. Differences between physical, futures, offsets, and private market funds
- v. Commodity price forecasting errors
- vi. How carbon could be the best performing asset class in the CIO View

i) Volatility of carbon allowances has declined as the ETS market has evolved

Figure 3: Declining 12m rolling volatility



Source: DWS analysis based on Bloomberg (November 2023)

It was always the intention that Europe's carbon market should evolve and improve based on experience. Indeed, Phase #1 (2005-07) was a 'learning by doing' pilot with almost all allowances given to companies for free. As reliable emissions data did not yet exist, the number of allowances exceeded emissions and the price fell to zero. This is just one example of how policymakers and the market learned from experience and supported reforms to the ETS rules over time.

Figure 3 shows how volatility has declined as the market has become more predictable such as through the operation of the Market Stability Reserve (MSR).

The EU has financially supported expanding carbon markets globally, drawing on the ETS experience. The EU and other countries supported the World Bank's Partnership for Market Readiness from 2011-2021. Due to this program, 23 countries representing 46% of carbon emissions have the basics of carbon pricing in

place. A successor program continues to support countries implement carbon markets and pricing policies¹⁸.

No assurance can be given that any forecast, target, or opinion will materialize. Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

¹⁷ EU Commission (October 2023) [Carbon market report](#)

¹⁸ Partnership for Market Implementation (2021) <https://pmiclimat.org/about>

ii) Carbon's correlations with major asset classes

With reform and strengthening of the market that has occurred particularly after 2020, the correlation of carbon allowances with indices covering European companies (as measured by the MSCI European Union index), has grown over time as shown in [Figure 4](#). The graph also shows the importance of not just taking the correlation at a particular point in time.

We have assessed the correlation with other asset classes as also low but increasing.

Figure 4: Increasing correlation with European equities



Source: DWS analysis based on Bloomberg (November 2023)

iii) Carbon market liquidity – Anastasia Manuel, Xtrackers Capital Markets team

Since inception of the emissions trading scheme, the EUA market has developed significantly and now offers both a liquid primary and secondary market.

Alongside the distribution of the free allowances and a small number of reserved EUAs for specific European funds, the remainder is sold through auctions in the primary market. To partake in the auctions of buying and selling EUAs, admission criteria are required to be met including establishment in the EU and a nominated registry and bank account. The number of daily bidders in the auction trended upwards between 2017 and 2021 and has since reverted towards 2017 participation levels, as shown in [Figure 5](#).

The European Energy Exchange (EEX) supports both the primary and secondary market of EUA trading and serves as both the appointed EU common auction platform, operating an almost daily auction¹⁹, and a leading venue for EUA spot and futures trading in the secondary market. As [Figure 6](#) demonstrates, the auctions vary slightly by volume, most notably auction volumes are reduced by approximately 50% during August to account for the holiday season.

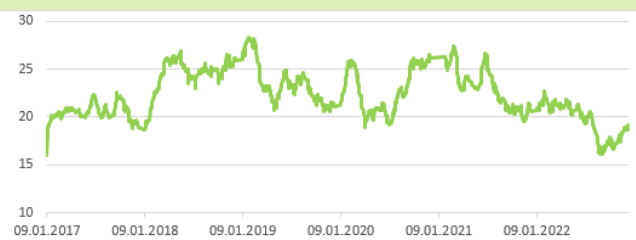
There may be a change in market seasonality as the EU has published a proposal that companies' 2024 compliance deadline for surrendering EUAs that match companies' emissions, should be shifted from 30 April to 30 September. The shift is proposed to give Member States more time to calculate companies' eligibility for free allowances after companies submit reports on their economic activity levels²⁰.

No assurance can be given that any forecast, target, or opinion will materialize. Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

¹⁹ <https://www.eex.com/en/market-data/environmentals/eu-ets-auctions>

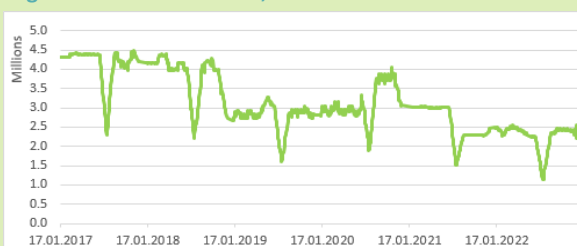
²⁰ Carbon Pulse (13 November 2023)

Figure 5: Total number of bidders daily



Source: DWS analysis based EEX Emission Spot Primary Market Auction Report (2017-2022)

Figure 6: Auction Volume, Tco2



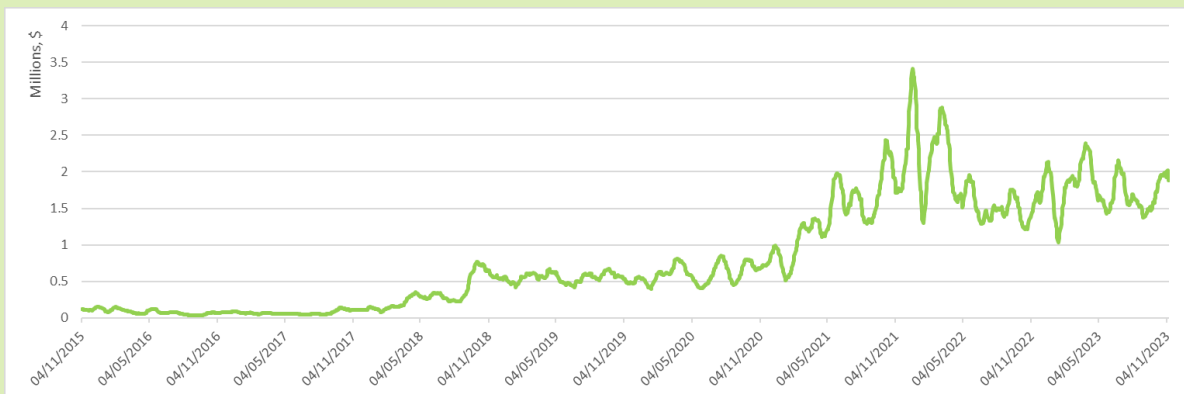
Source: DWS analysis based EEX Emission Spot Primary Market Auction Report (2017-2022)

Secondary trading

Following auctions, EUAs can be transacted in the secondary market. The secondary market over the last few years has become increasingly electronic, with market liquidity spread out across spot, forward and future markets. Most trading is transacted on exchange with a small portion traded over-the-counter (OTC).

Endex (ICE) and EEX are the leading venues for EUA spot²¹ and futures trading on exchange²². Nasdaq Oslo is an alternative venue with typically smaller volumes traded. EUA futures on ICE can be traded as electronic futures, exchange for swap (EFS) and block trades with most of the liquidity traded on the first December contract, **Figure 7**. According to Bloomberg, on average, up until Q3 this year, the ICE EUA December futures contract traded approximately €1.7mn daily. Futures contracts are the most used hedging tool of market participants transacting in the physical EUAs and physically backed EUA Exchange Traded Commodity (ETC) and since the price rally in 2020 and 2021, liquidity has been reasonably stable in the futures market in general. Lastly, there is the OTC market, where there is a bilateral transaction between brokers or traders and corporates which most often have an obligation to buy the emission allowances ('compliance users').

Figure 7: ICE EUA December Future Volume



Source: DWS analysis based on Bloomberg (Ticker: MODEC1 Comdty)

No assurance can be given that any forecast, target, or opinion will materialize. Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

²¹ <https://www.eex.com/en/market-data/environmentals/spot>

²² <https://www.ice.com/products/197>

iv) Comparing physical, futures, offsets, and private market funds

There are different ways to invest in carbon as shown in **Figure 8**.

Figure 8: Different ways to invest in carbon

	Physical carbon allowances	Rolled Futures	Carbon offsets	Private market investments: Primary market
What is it?	A Special Purpose Vehicle (SPV) holds carbon allowances which would be owned by an Exchange Traded Commodity (ETC). High demand could increase the ETS price	Futures are rights to purchase allowances at a pre-determined date and price. For investors, futures are rolled regularly and not settled into allowances	Purchasing offset credits from nature restoration or protection, energy efficiency, renewable projects Voluntary system	Private equity/debt investments in infrastructure, real estate, private credit, direct lending can play key roles in reducing emissions ²³ . Asset managers can also create project level financing vehicles for corporates' supply chains for renewable or other sustainability projects
Pros	Avoids investment fees from rolling futures contracts. Avoids contango* costs	Unfunded investment – portfolio remains 100% invested in equities. Established futures market	May provide positive externalities such as biodiversity, job creation, empowering women. Transparency and ease of explaining the project	Buying offsets are an expense while private market funds yield a return. Corporates outsourcing financing of supply chain emission reductions can help
Cons	If held within an equity portfolio there could be Equity Dilution due to ownership of allowance contracts ETC fees Reliant on listed debt securities	No direct ownership of allowances and hence the impact on carbon emissions or prices is likely low. Incurs contango* costs [1-2] % per year.	Buying credits are a cost Actual carbon reduction can be questionable and/or difficult to establish ex ante, though there are project ratings increasingly available ²⁴	Corporates and supply chain companies investing into a fund may require a mentality change. Project development can take time. Emission reduction potential of different private market funds can vary. Not investable in liquid portfolios

Source: DWS analysis (November 2023)

* Contango is where the futures market price of a commodity is higher than the spot price. In futures markets, prices will usually converge toward the spot prices as the contracts approach expiration.

v) Commodity price forecasting

It's all about the vol...

From our experience, not all commodities are equal when it comes to price forecasting²⁵

Figure 9 compares commodity volatility on the one hand with the average absolute analyst forecasting error for various commodities over the past decade. To calculate the forecasting error, we take the consensus forecast for each commodity at the start of the year and compare it with the final price outturn. The chart shows a clear positive correlation: namely, the higher the volatility, the larger the analyst forecasting error for that commodity.

This work suggests that one can have a relatively high degree of confidence when it comes to the year ahead price forecast for gold and copper since price forecasts typically only diverge from the final outturn by no more than 10%. But when it comes to energy commodities, you need to take price forecasts with a heavy pinch of salt. Our analysis shows that commodities within the energy complex such as Brent crude oil and US natural gas have higher levels of volatility which are associated with large forecasting errors particularly compared to base and precious metals. A large part of this volatility divergence can be explained by the variation of consumption-to-inventory ratios across the commodity spectrum, which are typically lower for metals and higher for energy commodities.

No assurance can be given that any forecast, target, or opinion will materialize. Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

²³ For instance: DWS Research Institute (2023) [Direct lending and European Transformation; DWS Alternatives research reports](#)

²⁴ Such as <https://bezerocarbon.com/>

²⁵ This section updates analysis published by the DWS Research Institute in September 2022 [Making sense of carbon price forecasting](#).

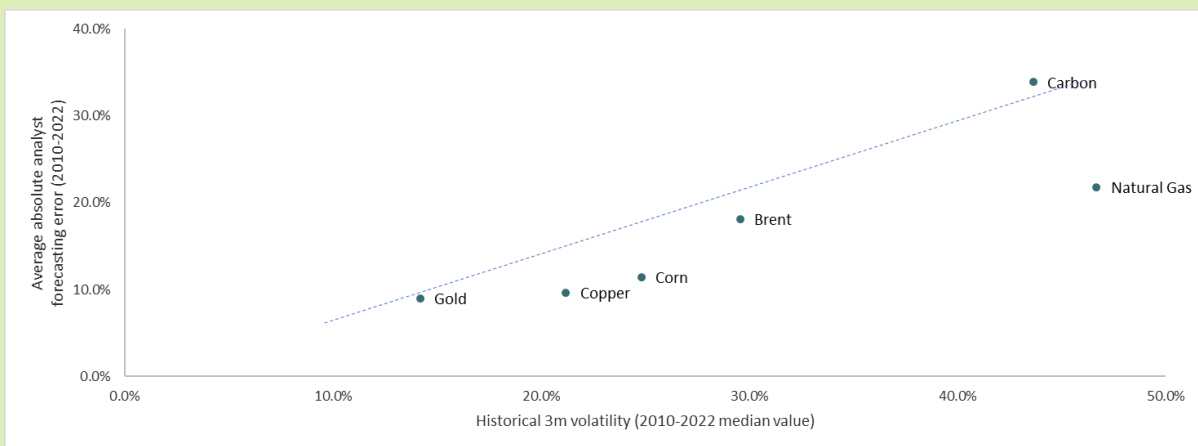
Comparing commodity price forecasting error track records

To get a sense of how the track record of the commodity analyst community compares to financial markets, we compare how well analysts perform versus commodity forward curves. We calculate the forecasting error of the forwards by examining the calendar forward for each respective commodity at the start of each year and compare it with the final price outturn.

Similar to the results from analyst forecasting errors, the forward curves show a tendency to register an increasing forecasting error of the forwards in line with the level of the volatility, **Figure 10**. In addition, European carbon prices are at the top of the forecasting error naughty list. Also telling is that the forecasting error of the forwards is lower than the consensus analyst across all commodities. This might suggest that when it comes to commodity price forecasting, it might be wise to play more respect to the forwards than the analyst community.

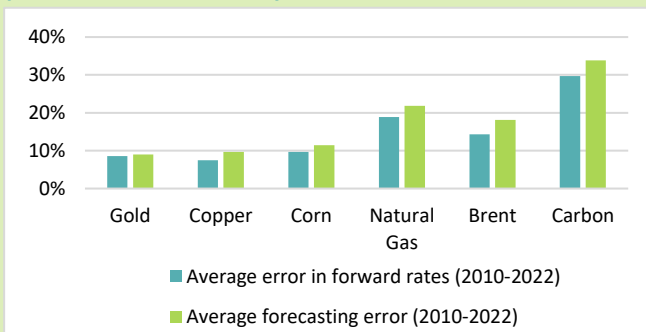
With the declining volatility of carbon, analysts forecasting accuracy has improved as shown in **Figure 11**. However, there are 9 financial institutions providing carbon price forecasts available (8 available on Bloomberg). A wider set of consultants or specialised brokers make ETS price forecasts which we do not include here. This compares with 30 analysts forecasting the West Texas Intermediate (WTI) oil price. We expect more analysts to start or re-start covering the ETS price.

Figure 9: The higher the vol, the higher the forecasting error



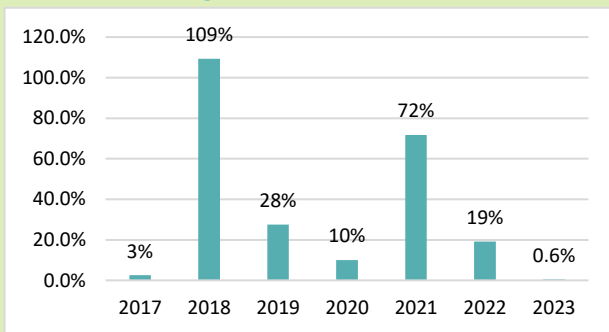
Source: DWS analysis, Bloomberg (November 2023). We take the Bloomberg median forecast for each commodity at the start of the year and compare the final outturn. We then calculate the average absolute forecasting error

Figure 10: Forwards have been better at predicting commodity prices than consensus analysts.



Source: DWS analysis, Bloomberg (November 2023). We plot the average analyst forecasting error with the calendar forward at the start of the year and compare that to the final price outturn

Figure 11: Carbon allowance price analyst forecasting errors are becoming more accurate.



Source: DWS analysis, Bloomberg (November 2023).

No assurance can be given that any forecast, target, or opinion will materialize. Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

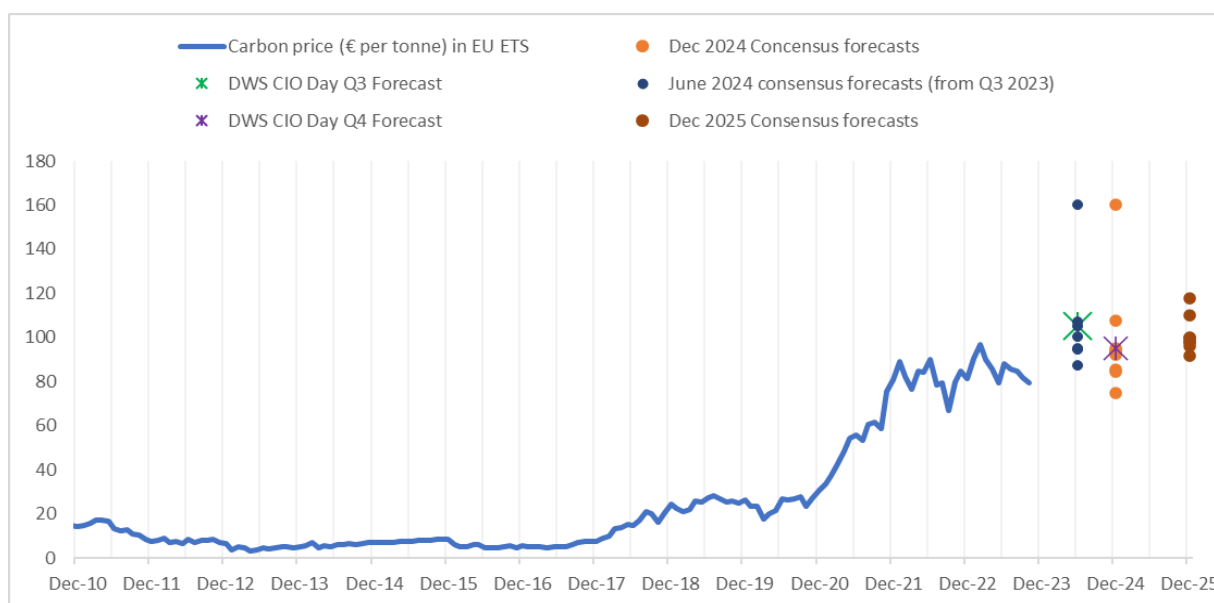
vi) Carbon could be one of the best performing major asset class over the next year

For the last year and a half, the Research Institute team have forecast the next year's ETS carbon price. We use aspects including the direction of relevant public policies, energy prices, the forward curve and sell side analyst forecasts to determine our forecast as shown in [Figure 12](#). We reduced our Q3 price forecast to account for economic macro uncertainty.

The CIO View²⁶ is DWS's quarterly financial market forecast of macroeconomic indicators and individual asset classes over the next year. Each quarter, DWS asset class and sector experts contribute their views on a key 'alpha source' in an asset class meeting. These forecasts will then be taken into a cross-asset class meeting combining bottom-up and top-down perspectives into DWS's official forecasts.

Based on our forecast, carbon could be one of the best performing asset classes over the next year.

Figure 12: DWS ETS carbon price forecast and consensus estimates



Source: DWS Research Institute analysis, Bloomberg

3 / Equity price risk from carbon: hedging opportunity

In this section, we present:

- i) updated CROCI® analysis of the impact of hypothetical carbon cost on listed equities²⁷,
- ii) summarise CROCI research on corporate financial statements and carbon accounting,
- iii) explain why the EU carbon border tariff may increase demand for EUAs,
- iv) and discuss how the long-term direction for the EU's carbon price should be understood by assessing potential cost estimates for different industrial decarbonisation technologies.

No assurance can be given that any forecast, target, or opinion will materialize. Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

²⁶ DWS (November 2023) [CIO View](#)

²⁷ DWS CROCI (January 2023) [CROCI Outlook 2023: the Battle of the Suitors](#) (p.17-18)

i) Carbon price scenario analysis

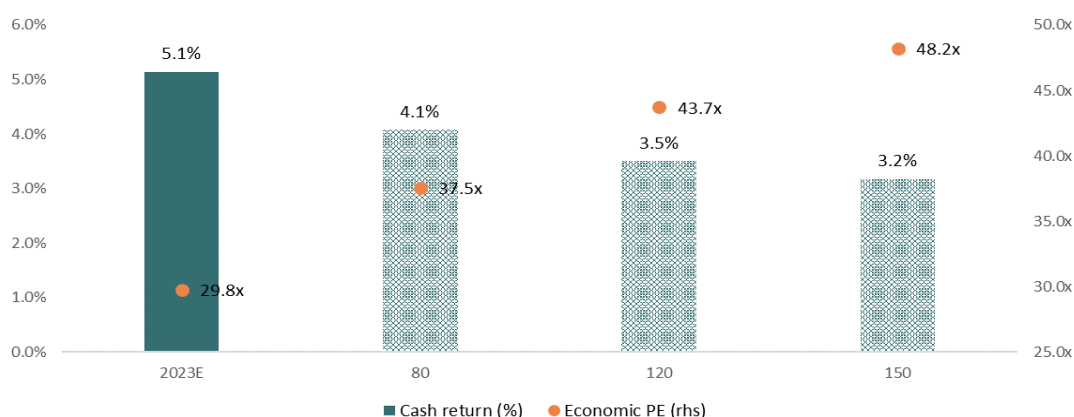
Cash Return on Capital Invested (CROCI)²⁸ is a cash-flow-based analysis which, by making a series of economic adjustments to traditional accounting data, aims to make non-financial companies comparable - regardless of industry or domicile.

DWS’s CROCI Investment Strategy & Valuation Group modelled how profitability, valuation and other fundamentals of specific companies would change under different assumptions regarding the increased expense to companies when bearing the cost of reducing carbon emissions.

We use a working assumption that industrial companies are not able to pass on the additional cost of carbon allowances. The European Commission extensively studied²⁹ the ability of sectors to pass on carbon costs, as part of the debate regarding rules for assessing carbon leakage risk and distributing free allowances during Phase 3 (2013-2020).

Focusing on major European companies and using a range of higher carbon prices as shown in **Figure 13**, economic PE and cash returns are likely to fall.

Figure 13: Higher carbon prices could drive down European companies’ Economic PE and cash returns



Source: DWS CROCI (November 2023)

Figure 14 shows the sector impact using a EUR 80 and companies’ disclosures of scope 1 and 2 emissions. While this is around the current price, we note that energy intensive companies have been largely insulated from the full impact of carbon pricing due to the distribution of free allowances. As the number of EUAs falls each year (the emissions cap) falls and as the proportion of allowances being auctioned increases, the ETS carbon price will increasingly affect energy intensive sectors.

In this analysis, we assume that companies are not able to pass on the cost of carbon allowances. The ultimate impact on companies will depend on their ability to share the costs of decarbonisation with final customers and suppliers. The appropriate share of cost sharing between governments and the private sector is also a key factor, such as public funding for technology commercialisation.

The CROCI figure presented represents return for the company over the life of the assets. Depreciation is charged economically, with similar assets having similar lives. In comparison, Return on Equity Does not represent an inflation-adjusted return. For example, depreciation is not charged economically, and asset life is inconsistent.

No assurance can be given that any forecast, target, or opinion will materialize. Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

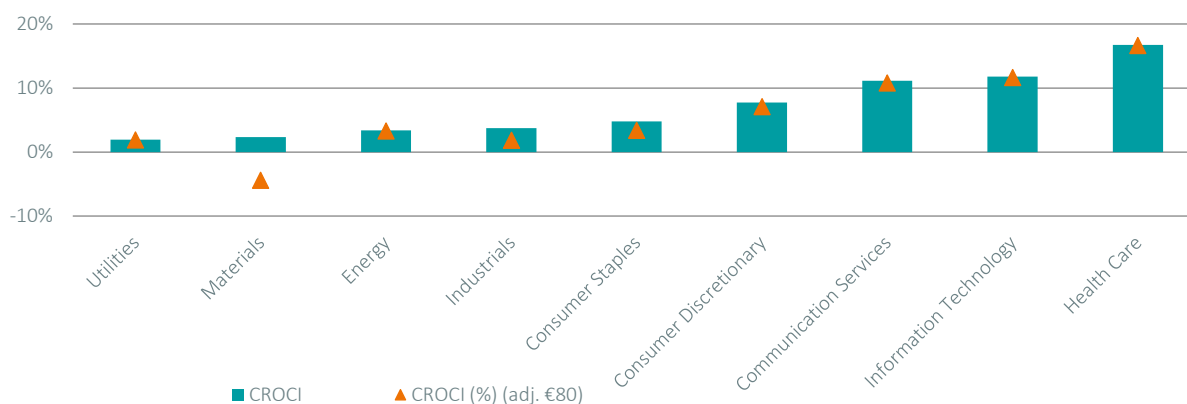
²⁸ CROCI is a registered trademark of DWS. All CROCI information is licensed from DWS’s CROCI Investment Strategy & Valuation Group (“CROCI”). This report does not constitute marketing of any product connected to CROCI Strategies or an offer, an invitation to offer or a recommendation to enter into any product connected to CROCI Strategies. The CROCI Investment Strategy and Valuation Group is responsible for devising the CROCI strategy and calculating the CROCI Economic P/E Ratios. The CROCI Investment Strategy and Valuation Group is not responsible for the management of the any product connected to CROCI Strategies and does not act in a fiduciary capacity in relation to such products.

²⁹ <https://www.dws.com/capabilities/active-investments/croci/> See [CROCI \(July 2023\)](https://www.dws.com/capabilities/active-investments/croci/) for an overview

²⁹ https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/free-allocation/carbon-leakage_en#studies

Figure 14 shows that the greatest change from applying EUR 80 occurs in companies in the utilities, materials, energy, and industrial sectors. A fuller assessment of the economic and financial impact, precise regulatory impact and how free/auctioned carbon allowances are treated as assets and liabilities needs stronger accounting standards.

Figure 14: Energy intensive sectors most impacted by higher carbon prices



Source: DWS CROCI (as of 31 October 2023)

ii) Financial statements and carbon accounting standards – CROCI's view

This section provides a short summary of CROCI Research's report [Carbon allowances & financial accounts: CROCI's approach & the need for an international accounting standard](#).

General Accounting Principles serve different interests and stakeholders and don't necessarily provide the global fundamental investor with a real picture of the underlying economics and financials of a company which also allow impairs ability to comparability companies on the sole basis of accounting metrics. The same problem occurs with the way emission allowances are not currently recognised within financial statements published by corporates. As ETS schemes spread worldwide and the carbon price surges, carbon allowances gain in economic importance and so there is increasing urgency to account for them appropriately when assessing the real profitability and valuation of companies.

Our analysis of major European companies finds insufficiently detailed and non-comparable carbon allowance financial disclosures. For instance:

- While most companies recorded free allowances at nil cost, two companies recorded these granted emission allowances at fair/market value on the grant date.
- Emission allowances related assets were recorded either as intangible assets, inventory, or other current assets. Classification under inventory was associated with allowances held for trading activity.
- All companies examined (except for one major power company) carried forward capitalized assets at cost without amortizing them; One power company amortized the allowances in accordance with International Accounting Standard #38 (Intangible Assets).
- Emission obligations were recognized when actual emissions occurred that give rise to an obligation. They were mainly recorded at the carrying value of emission allowances in hand and/or forward contract price and/or market value.
- Emission allowance assets and liabilities were derecognized when the allowances were surrendered to regulators.

Some European investors have already called on companies and accountants for better, more consistent financial disclosures to ensure 'Paris-aligned financial accounts'³⁰.

No assurance can be given that any forecast, target, or opinion will materialize. Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

³⁰ IIGCC (2020) [Investor Expectations for Paris-aligned Accounts](#)

However, for the last 17 years, accounting standards have failed to develop a standard for how companies account for emission allowances and other green credits in their financial statements.

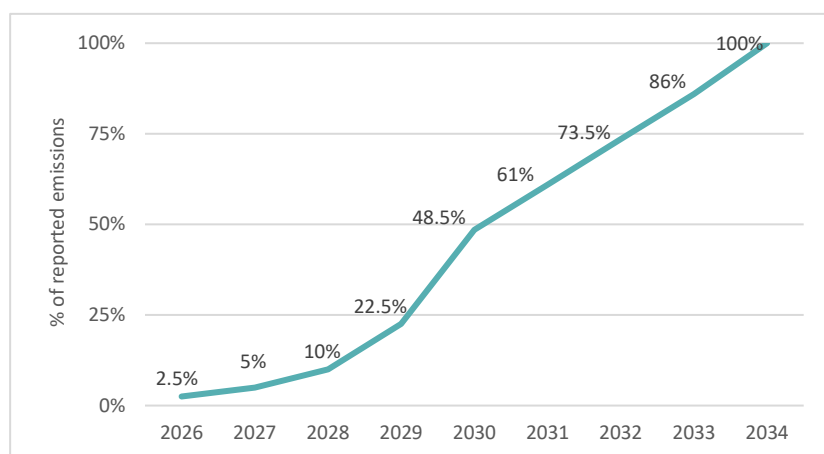
We call on policy makers, accountants, corporates, investors, and accounting standard setters to quickly develop a common carbon allowance and green credit accounting standard.

Efforts by the International Financial Reporting Standards (IFRS)³¹ and the US based Financial Accounting Standards Board (FASB)³² should be accelerated. The CROCI report provides recommendations for financial accounts to better account for carbon allowances and other regulatory based environmental credits.

iii) Internationalising the ETS with a carbon border tax: International companies’ hedging needs.

Europe’s Carbon Border Adjustment Mechanism (CBAM) aims to expand the industrials’ protection from carbon leakage by creating

Figure 15: European importers of carbon intensive commodities will need to buy a growing number of carbon certificates linked to the ETS price



Source: S&P Global Commodity Insights (February 2023) [EU Carbon Border Adjustment Mechanism](#)

a carbon border tax on imports to Europe.

Starting in 2026, companies importing power, iron and steel, cement, fertilizer, aluminium, hydrogen, and some polymers into the EU, will be required to surrender CBAM certificates, equivalent to the current EU carbon price to match emissions associated with their production.

The sector coverage of CBAM is likely to grow.

Currently, companies that import these products to Europe, are preparing emission estimates for disclosure to the EU.

As CBAM starts in 2026, a growing proportion of imported emissions from these industries will have to buy CBAM certificates linked to the ETS price, **Figure 15**. Companies affected may aim to hedge their future exposure, increasing EUA demand.

CBAM creates an incentive for Europe’s trade partners to create or strengthen domestic carbon pricing, as discounts may be provided where there is a carbon price tax or carbon market in the exporting country. This is Australia, Brazil, India, Indonesia, Taiwan, Turkey, UK, and Vietnam. There are even several US legislation proposals for a carbon border tariff, including from Republicans³³.

No assurance can be given that any forecast, target, or opinion will materialize. Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

³¹ IFRS (September 2023) [Climate-related and other uncertainties in the financial statements](#)

³² FASB (October 2023) [Accounting for Environmental Credit Programs](#)

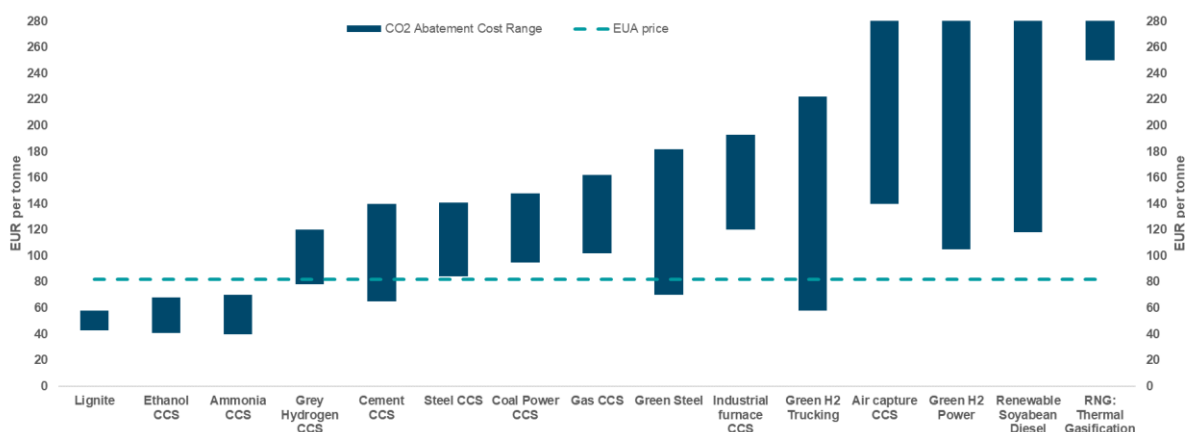
³³ HSBC (October 2023) European Green Deal: CBAM country and sector impacts start to emerge.

iv) Long-term cost of cutting industrial emissions

The long-term direction of the EU carbon price will depend on the speed and cost of decarbonising industry. **Figure 16** show how technology costs to abate emissions may be much higher than the current carbon price, which may indicate that EUA price may continue to rise.

Public support for technology development and demonstration may help reduce the cost differential to the current ETS price.

Figure 16: Carbon prices will likely have to rise significantly to help decarbonise heavy industry



Source: Morgan Stanley (January 2022). Carbon in 2022.

4 / Portfolio allocation to carbon allowances

We consider three ways to allocate carbon within an investment portfolio:

- i. Strategic Asset Allocation (SAA) portfolio optimisation.
 - ii. ETS relevant sector exposure in different climate equity indices.
 - iii. An Efficient Frontier for allocating carbon.
- i. Strategic Asset Allocation (SAA) portfolio optimisation and carbon

The objective of DWS's portfolio optimization is to achieve attractive returns for a given risk profile over the long run. Instead of addressing short-term market volatility the approach takes an explicit long-term view.

This is achieved by combining DWS's Long View market expectations (ten-year asset class forecasts³⁴ and DWS's proprietary award-winning optimization process – Group Risk in Portfolios (GRIP)³⁵. The DWS Long View is our fundamental framework to calculate forward-looking market expectations based on macro and empirical research in a data-driven multi-pillar approach. GRIP uses these inputs but focuses on diversified risk contributions.

This results in robust, well diversified allocations with no hidden risk concentrations. By using the power of strategic asset allocation to harvest risk premia the SAA Team aims to achieve attractive risk-adjusted returns. DWS colleagues have previously published reports³⁶ on adding ESG and Paris Aligned Benchmarks in SAA models.

No assurance can be given that any forecast, target, or opinion will materialize. Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

³⁴ [DWS Long View 2023](#)

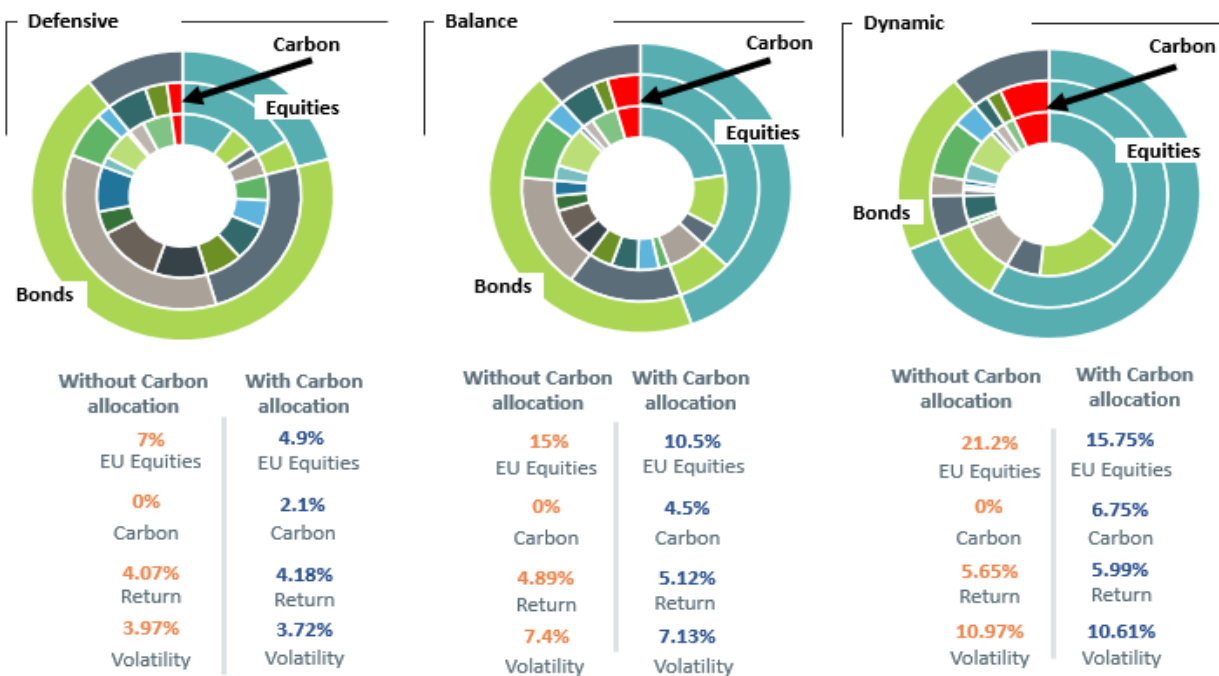
³⁵ DWS (May 2020) [Time to get a GRIP](#)

³⁶ DWS (July 2023) [ESG in Strategic Asset Allocation: the 2023 Update](#)

With the support of the SAA Team, we added our one-year EUA return forecast and an assumption of steady carbon volatility (30%) to the SAA portfolio optimisation model. **Figure 17** shows the results.

Adding a small carbon EUA allocation could improve portfolios’ return and reduce volatility.

Figure 17: Adding carbon to SAA model optimisation could improve returns and reduce volatility



Source: DWS analysis (November 2023). Allocations are subject to change without notice. Allocations may not add to 100% due to rounding.
 Source: DWS International GmbH, As of: May 2023 with addition of EU carbon allocation as of Nov 2023

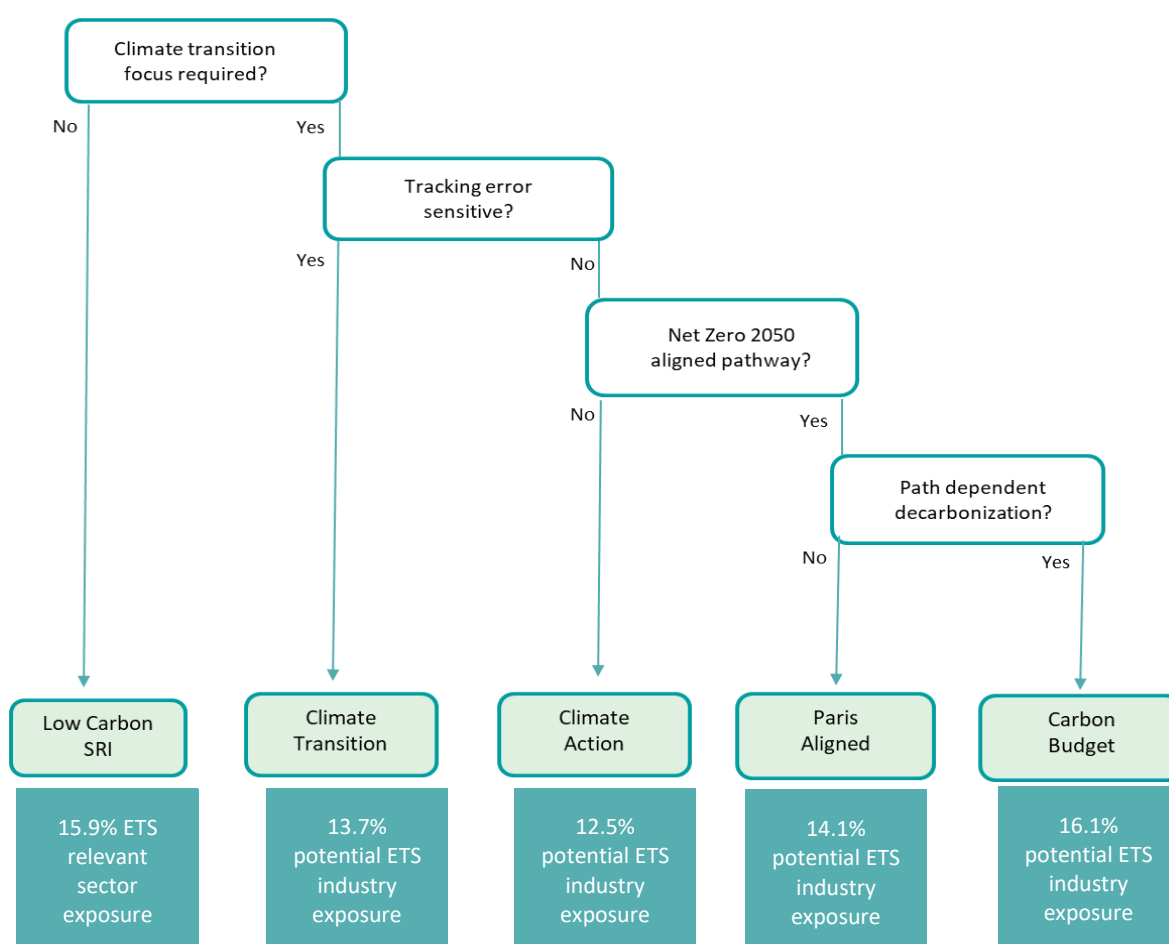
No assurance can be given that any forecast, target, or opinion will materialize. Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

ii) Hedging energy intensive sectors in climate equity portfolios

An alternative way to consider how to hold carbon allowances is to consider the sector holdings of different climate index benchmarks. We recently published a report *Navigating the Climate Index Jungle*³⁷, to understand the trade-offs of different climate indices. **Figure 18** shows a diagram from this report.

We overlay the holdings of the Industrial and Materials sectors as companies in these sectors may be fully or partially subject to the ETS and may have been receiving free allowances. Thus, the shift towards EUA auctioning may expose these sectors to financial risk, so EUA hedging may be relevant. Sector and company level specific exposure could be assessed to determine a hedging strategy. However, assessing the company level risk exposure would be improved as we discussed in the section on ‘Financial statements and carbon accounting standards’ (p.12).

Figure 18: Industrial and Materials exposure within different World climate benchmarks



Source: DWS Research Institute (September 2023) [Navigating the climate index jungle](#); Xtrackers, MSCI, S&P Global as of 31 Oct 2023

iii) An Efficient Frontier for carbon

A third alternative way to consider how to allocate to carbon is through the concept of an Efficient Frontier, which represents the trade-off investors must make between risk and returns when assessing allocation decisions between two different asset classes. DWS’s annual Long View report³⁸ on long-term ten-year return forecasts, includes Efficient Frontiers for multiple asset classes. We will look at adding carbon to this framework in future.

No assurance can be given that any forecast, target, or opinion will materialize. Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

³⁷ DWS Research Institute (September 2023) [Navigating the climate index jungle](#)

³⁸ DWS Research Institute (January 2023) [Long View](#)

5 / Conclusion

Investors seek to deliver returns for their ultimate clients, and thus the ETS is an attractive opportunity. Investing in carbon allowances should be seen as complementary net zero transition and risk hedging strategy alongside other transition focused investment in public and private markets, and investor engagement with companies, market standard setters and policymakers.

Investor participation could help push up the carbon price and strengthen the incentive for companies to cut emissions, which could create issues as we examine below.

In general, carbon prices do need to be higher to strengthen the incentive to cut emissions. However, some of the barriers to decarbonisation are not just about a higher carbon price. Other issues may include delays in constructing power grids, companies having sufficient specialised trained staff, the challenge of involving supply chains and customers in adopting new technologies and sharing the costs of technology demonstration and commercialisation.

To conclude, we briefly discuss three issues which are of growing importance.

i) Post 2030 carbon market and investor climate policy engagement

If the ETS cap continues to decline at the current rate, the ETS will approach an ‘end game’ in the late 2030s. We agree with academics that examining potential implications and policy reforms³⁹ will become increasingly important in the coming years. We recommend greater discussion with investors and companies on the future direction of the carbon market.

An ‘Agency for Integrated Carbon Market Regulation’ has been recommended⁴⁰ to facilitate cooperation between the European Commission, ESMA and national regulators and to support policy proposal development and taking an independent advisory role in the legislative process. This could be a sensible addition if it is well integrated into the governance of Europe’s net zero transition and if it facilitates greater private sector policy engagement.

Many investors are committed to contributing to net zero emissions and view the EU ETS and other carbon markets as key public policy tools. The Net Zero Asset Owner Alliance has set out expectations⁴¹ for asset managers to be active in climate policy engagement. The investment industry needs to find ways to step up efforts in this area, including advocating for stronger carbon markets around the world.

ii) Caution regarding potential carbon reduction claims from buy-and-hold EUA strategies

In our prior paper on the ETS⁴² we reviewed three separate studies that estimated that holding one EU allowance for ten years could lead to an emission reduction, particularly due to how the Market Stability Reserve (MSR) works to cancel allowances.

An academic that advises different NGOs that promote the retirement of EUAs argued⁴³ in an article in the German newspaper Handelsblatt, that this is not a correct interpretation of how the MSR works. The operating MSR is indeed complex, so we agree caution is required about carbon reduction claims from a buy-and-hold strategy.

In addition, Dr. Simon Quemin from the Potsdam Institute for Climate Impact Research (who also advises an investment firm focused on carbon allowances), published a correction⁴⁴ to his modelling of potential carbon savings from holding EUAs, reducing the estimate of potential savings by ten-fold.

Other factors being equal, an increase in demand for physical allowances is likely to increase the price of EUAs. But this will depend on the actual growth of investor participation in the ETS market and the interaction with other factors. We recommend further independent studies of potential implications of EUA buy-and-hold strategies.

No assurance can be given that any forecast, target, or opinion will materialize. Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

³⁹ Pahle, Michael et al. (February 2023) [The Emerging Endgame: The EU ETS on the Road Towards Climate Neutrality](#)

⁴⁰ Quemin and Pahle (2022) [Financials Threaten to Undermine the Functioning of Emissions Markets](#)

⁴¹ NZAOA (2023) [Aligning climate policy engagement with net zero commitments](#)

⁴² DWS Research Institute (February 2022) [Carbon pricing and carbon allowances](#)

⁴³ <https://www.cliccs.uni-hamburg.de/de/about-cliccs/news/2023-news/2023-05-12-emissionszertifikate-interview-perino.html>

⁴⁴ Quemin, Simon (June 2023) <https://sparkchange.io/wp-content/uploads/2023/07/2023-06-23-Corrigendum.pdf>

iii) Monitoring investor ETS participation – carbon investing as a climate transition supporting strategy

The European Securities and Markets Authority's (ESMA) report on the ETS concluded that the market is functioning as expected. One aspect of their report included buy-and-hold strategies. ESMA⁴⁵ stated *"the potential scope for growth as well as the launch of new investment vehicles or instruments in the future warrants monitoring. This is particularly the case in a context where investors pay increasing attention to climate-related policies and risks, including the role of carbon markets in facilitating the transition to a low-carbon economy"*.

Dr. Simon Quemin and Dr. Michael Pahle from the Potsdam Institute for Climate Impact Research published an article⁴⁶ in the journal *Nature Climate Change*, focused on the participation of financial institutions in the ETS. The title of the article is *"Financials Threaten to Undermine the Functioning of Emissions Markets"*, however their analysis and conclusions are balanced.

They conclude that there is a "widespread misconception that speculation is simply unethical" and that financial institutions play an important role in markets by providing liquidity, facilitating risk transfer, and helping discover the price for the market. *"The negative consequences of the absence of financial trading have become apparent in South Korea and China, where regulators are opening up their national allowance markets to financials to alleviate illiquidity problems (e.g. low trading volume, high price volatility)."*

During the legislative debate on the Phase 3 (2013-2020) and Phase 4 (2021-2030) ETS rules, there were attempts to introduce amendments to restrict participation of financial institutions. Trade associations such as the International Emissions Trading Association (IETA) strongly argued that doing so would damage the ETS⁴⁷. Amendments to restrict financial institution participation in the ETS, did not succeed.

Quemin and Pahle conclude that this is a potential 'looming' issue if there is greater participation of 'buy and hold' investors at the same time as the ETS cap is declining. They recommend ways for ESMA to strengthen its market monitoring before any restrictions are contemplated. "Simply banning financials altogether would be counterproductive... a proper balance of financial trading and regulation should be sought".

We support the need for improved monitoring of the ETS market. Open discussion is needed with policymakers and regulators regarding how investors can make balanced use of buy-and-hold EUA strategies to help hedge risks, enable engagement with energy intensive sectors, create returns for clients, and strengthen the ETS price.

No assurance can be given that any forecast, target, or opinion will materialize. Forecasts are based on assumptions, estimates, views and or analyses, which might prove inaccurate or incorrect.

⁴⁵ ESMA (2022) [Final Report – Emission allowances and associated derivatives](#) p.50

⁴⁶ Quemin and Pahle (2022) [Financials Threaten to Undermine the Functioning of Emissions Markets](#)

⁴⁷ IETA (2022) [Restricting market access will damage the ETS](#)

Important information – EMEA & APAC

DWS is the brand name of DWS Group GmbH & Co. KGaA and its subsidiaries under which they do business. The DWS legal entities offering products or services are specified in the relevant documentation. DWS, through DWS Group GmbH & Co. KGaA, its affiliated companies and its officers and employees (collectively “DWS”) are communicating this document in good faith and on the following basis.

This document is for information/discussion purposes only and does not constitute an offer, recommendation or solicitation to conclude a transaction and should not be treated as investment advice.

This document is intended to be a marketing communication, not a financial analysis. Accordingly, it may not comply with legal obligations requiring the impartiality of financial analysis or prohibiting trading prior to the publication of a financial analysis.

This document contains forward looking statements. Forward looking statements include, but are not limited to assumptions, estimates, projections, opinions, models and hypothetical performance analysis. No representation or warranty is made by DWS as to the reasonableness or completeness of such forward looking statements. Past performance is no guarantee of future results.

The information contained in this document is obtained from sources believed to be reliable. DWS does not guarantee the accuracy, completeness or fairness of such information. All third party data is copyrighted by and proprietary to the provider. DWS has no obligation to update, modify or amend this document or to otherwise notify the recipient in the event that any matter stated herein, or any opinion, projection, forecast or estimate set forth herein, changes or subsequently becomes inaccurate.

Investments are subject to various risks. Detailed information on risks is contained in the relevant offering documents.

No liability for any error or omission is accepted by DWS. Opinions and estimates may be changed without notice and involve a number of assumptions which may not prove valid.

DWS does not give taxation or legal advice.

This document may not be reproduced or circulated without DWS’s written authority.

This document is not directed to, or intended for distribution to or use by, any person or entity who is a citizen or resident of or located in any locality, state, country or other jurisdiction, including the United States, where such distribution, publication, availability or use would be contrary to law or regulation or which would subject DWS to any registration or licensing requirement within such jurisdiction not currently met within such jurisdiction. Persons into whose possession this document may come are required to inform themselves of, and to observe, such restrictions.

For institutional / professional investors in Taiwan:

This document is distributed to professional investors only and not others. Investing involves risk. The value of an investment and the income from it will fluctuate and investors may not get back the principal invested. Past performance is not indicative of future performance. This is a marketing communication. It is for informational purposes only. This document does not constitute investment advice or a recommendation to buy, sell or hold any security and shall not be deemed an offer to sell or a solicitation of an offer to buy any security. The views and opinions expressed herein, which are subject to change without notice, are those of the issuer or its affiliated companies at the time of publication. Certain data used are derived from various sources believed to be reliable, but the accuracy or completeness of the data is not guaranteed and no liability is assumed for any direct or consequential losses arising from their use. The duplication, publication, extraction or transmission of the contents, irrespective of the form, is not permitted.

© 2023 DWS Investment GmbH

Issued in the UK by DWS Investments UK Limited which is authorised and regulated in the UK by the Financial Conduct Authority.

© 2023 DWS Investments UK Limited

In Hong Kong, this document is issued by DWS Investments Hong Kong Limited. The content of this document has not been reviewed by the Securities and Futures Commission.

© 2023 DWS Investments Hong Kong Limited

In Singapore, this document is issued by DWS Investments Singapore Limited. The content of this document has not been reviewed by the Monetary Authority of Singapore.

© 2023 DWS Investments Singapore Limited

In Australia, this document is issued by DWS Investments Australia Limited (ABN: 52 074 599 401) (AFSL 499640). The content of this document has not been reviewed by the Australian Securities and Investments Commission.

© 2023 DWS Investments Australia Limited

as of November 2023; CRC: 098801_1.0 (11/2023)