IMPLICATIONS OF THE FRTB FOR CARBON CERTIFICATES: A GLOBAL PERSPECTIVE

INTERNATIONAL SWAPS AND DERIVATIVES ASSOCIATION
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PREFACE

The Fundamental Review of the Trading Book (FRTB) includes higher capital charges for carbon trading under the standardized approach to market risk, which has implications for banks in their role as intermediaries in the emissions trading system (ETS).

In an earlier paper, ISDA investigated whether the regulatory treatment of carbon credit trading under the FRTB is justified by focusing on the EU ETS[1]. The appropriate treatment is important as overly stringent capital requirements would impair the functioning of the carbon market and hamper the willingness of firms to invest in the transformation to a green economy.

This paper extends the findings by investigating the risk of carbon certificate trading in two North American markets – the Western Climate Initiative (WCI) and the Regional Greenhouse Gas Initiative (RGGI) – as well as the UK's Emissions Trading Scheme (UK ETS).

[1] Implications of the FRTB for Carbon Certificates, July 2021, www.isda.org/a/i6MgE/Implications-of-the-FRTB-for-Carbon-Certificates.pdf

MAIN FINDINGS AND RECOMMENDATIONS

Key Conclusions

The results of the global study confirm the findings of ISDA's previous analysis of the EU carbon trading market, suggesting the current FRTB treatment of carbon certificates disproportionally penalizes carbon credit trading. This can hamper a cost-effective transition to carbon neutrality, as inappropriately high capital charges impair banks' ability to act as intermediaries in the global trading of carbon certificates. In particular, the FRTB treatment of carbon certificates appears misaligned with the underlying volatility and the risk of carry positions both in North American and European markets.

High risk weights: The results of ISDA's analysis confirm that the risk weight for carbon certificates under the standardized approach to market risk is too high. The estimated stressed period of volatility in the two North American markets is well below the respective FRTB volatility classification for carbon certificates. The analysis shows the volatility of the RGGI and WCI corresponds to 33% and 20%, respectively. This is below the 56% volatility observed in the EU ETS market. Due to the EU ETS's dominance in terms of size and maturity (it covers 79% of global carbon certificate trading), ISDA suggests using a risk weight corresponding to the estimated higher volatility in the European market. This confirms that a risk weight of around 37%, less than two thirds of the 60% risk weight currently prescribed by the FRTB framework, would be appropriate. Viewed in isolation (disregarding spillover effects to other parts of the portfolio), this would imply an almost 40% lower capital charge.

Treatment of carry positions: Carry positions are an imperfect hedge if physical storage costs fluctuate. Therefore, the FRTB imposes a correlation of 0.99 between spot and forward positions. As argued in the previous report, carbon certificates are not typical commodities as there are no physical storage costs[2]. Consequently, a much higher correlation for carbon certificates is appropriate. In fact, data on futures with short and long maturities show a correlation of around 0.995 and 0.993 for the RGGI and WCI, respectively. This is slightly lower than in the EU ETS and UK ETS markets, where the respective correlation corresponds to 0.996 and 0.997. As the EU is by far the most developed emissions trading market, ISDA recommends assessing capital charges for carbon certificates based on the correlation observed for EU Allowances (EUAs). Including this correlation in a simplified example of a typical carry position implies an almost 40% reduction in the capital charge of carbon certificates. ISDA recommends setting a tenor correlation parameter (medium correlation scenario) for carbon certificates of 0.995-0.999, reflecting empirical observations.

The analysis supports ISDA's previous recommendations for the EU market, resulting in a risk weight of 37%[3] and a tenor correlation of 0.996. These combined would imply a 60% reduction in capital requirements, based on the simplified example for a typical carry position of a bank.

[2] www.isda.org/a/i6MgE/Implications-of-the-FRTB-for-Carbon-Certificates.pdf

[3] The European Commission's third Capital Requirements Regulation proposes the introduction of a new carbon trading bucket with an allocated risk weight of 40% (https://ec.europa.eu/info/publications/211027-banking-package_en)

Emissions Trading Schemes Have Become a Global Tool to Facilitate a Green Transition

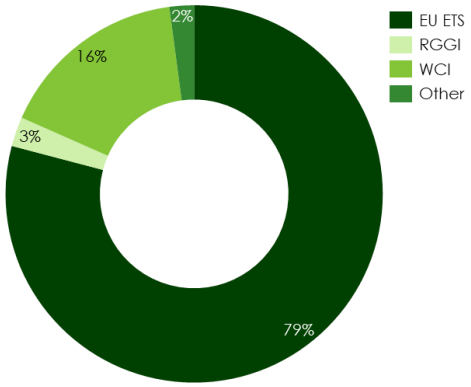
ETSs have become a central tool for governments around the globe to limit greenhouse gas (GHG) emissions. This type of system is favored for two key reasons:

1) An ETS allows governments to set a cap on the level of GHG emissions that matches their climate goals;
2) An ETS enables the reduction in GHGs to be realized efficiently (ie, with the lowest possible economic costs) through the trading of carbon certificates.

Carbon credit markets are appearing globally as an economically efficient way of reducing GHG emissions. Following the EU ETS, which covers 79% of the volume of all carbon certificate trades, the most established emissions trading markets are the RGGI and WCI in Northern America, covering around 19% of all carbon certificate trades as of 2020 (see Figure 1). In total, these three markets cover around 98% of all carbon certificate trading (based on 2020 data).

The ETSs in Northern America and the UK closely resemble the EU ETS. All four markets set emissions reduction targets and compliance periods, and allocate allowances through auctioning or free allocation. However, the overall and annual reduction targets and the respective compliance periods vary across ETSs. Furthermore, the RGGI only targets carbon dioxide (CO_2) reductions, while the EU ETS and WCI cover multiple GHG emissions[4].

Figure 1
Size of Global Carbon Credit Markets



Note: The chart indicates the share of the volume of emissions covered by the EU ETS, RGGI and WCI as of 2020
Source: Refinitiv Carbon Market Year in Review 2020

The RGGI became effective in 2009, and comprises the power sector in 11 US states: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont and Virginia. It is designed so that individual member states are assigned shares of a total cap of CO_2 emissions from covered fossil-fuel fired power plants[5]. The WCI was established in 2011

[4] International Carbon Action Partnership Status Report (2021) *Emissions Trading Worldwide;* Borghesi, S., & Montini, M. (2016) *The best (and worst) of GHG emission trading systems: Comparing the EU ETS with its followers*
[5] www.rggi.org/sites/default/files/Uploads/Fact%20Sheets/RGGI_101_Factsheet.pdf

as a collaboration between California and the Canadian provinces of Quebec and Nova Scotia[6]. Each state or province sets an emissions reduction target and issues allowances covering emissions from industry, transportation, electricity, and commercial and residential fuel use[7]. The emission caps set by both the RGGI[8] and WCI[9] are being tightened over time to slow down emission paths.

The UK ETS was launched in 2021, and replaces UK's former membership in the EU ETS market. It covers the UK's power sector, energy-intensive industries and aviation within the UK and European Economic Area (EEA)[10].

The world's largest scheme was launched in China in 2021. However, policies on the involvement of financial players in this market have not yet been established[11]. This means carbon certificates are not traded on the secondary market – ie, through banks.

Efforts are also under way to establish so-called voluntary carbon credits, which enable governments and companies to voluntarily offset their emissions outside of compliance schemes.

Increasing Carbon Prices Help Limiting the Global Increase in Temperatures

The price development of carbon certificates is determined by the demand for and supply of carbon allowances, which is affected by expected regulations in the future. Anticipation of a tightening of climate targets and the resulting reduction of the emissions cap can lead to an increase in carbon certificate prices. Price development in the various markets is therefore expected to react proportionally to expected climate ambitions and local market conditions. While prices in the different markets can show similar trends as a reaction to global developments, a general linkage of absolute prices and their development over time across markets is not expected.

Since their initiation, both the RGGI and WCI have gained in trading volume. Apart from a decline during the COVID-19 pandemic in 2020, prices have remained fairly stable since their initiation and have increased rapidly since 2021 (see Figure 2)[12]. Price development in the UK ETS closely resembles the experience of the EU ETS market. Since its inauguration, prices in the UK ETS market sharply increased from $64 to $110 but experienced a temporary interruption of this upward trend between September and November 2021 (see Figure 2).

The strong increase in prices observed globally since 2021 can be seen in light of a recent tightening of climate policies, as well as the introduction of stability mechanisms. The latter include minimum prices (California and Québec) and market reserves, which put a limit on the surplus supply of allowances – for example, the market stability reserve in the EU, the supply adjustment mechanism in the UK and the emission containment reserve in the RGGI[13]. As there is no trading of certificates across ETSs, it is unsurprising that the price development differs between these markets.

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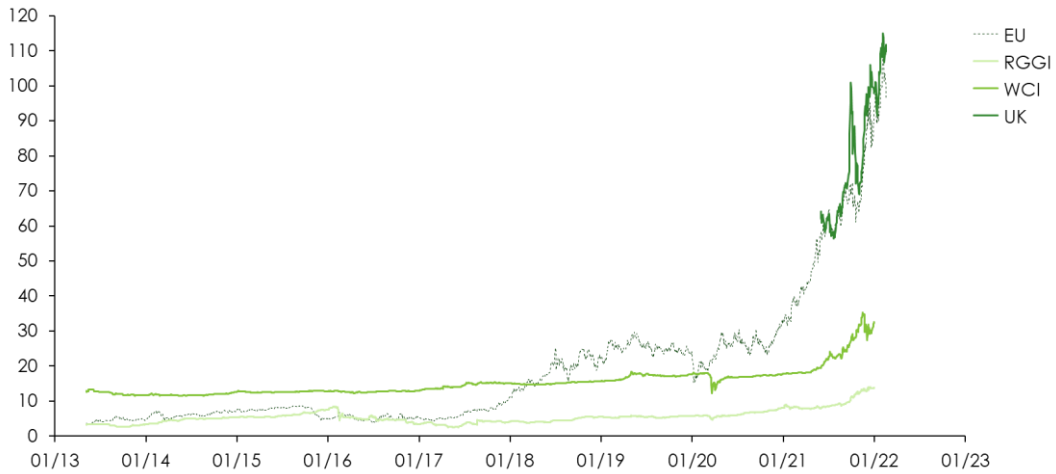
[6] https://wci-inc.org/our-work/program-design-and-implementation
[7] http://westernclimateinitiative.org/index.php?option=com_content&view=article&id=33&Itemid=48
[8] White and Case (2017) *Greenhouse gas emissions trading schemes: A global perspective*
[9] https://wci-inc.org/our-work/approach
[10] International Carbon Action Partnership Status Report (2021) *Emissions Trading Worldwide*
[11] World Bank (2021) *State and Trends of Carbon Pricing 2021*
[12] Only allowances issued in California are observed for the WCI market
[13] International Carbon Action Partnership Status Report (2021) *Emissions Trading Worldwide*

Figure 2
Price Development in Northern American and European Markets (2013-2022)
US$ per tCO2e



Note: RGGI, WCI and EU ETS one-month future prices and UK ETS daily future prices. Prices of certificates traded in the EU and UK are converted from euro and sterling to US dollar at the exchange rate of 1.12 and 1.34 (28/02/2022), respectively. Due to lacking data on certificate trades issued in Quebec and Nova Scotia, the WCI market only comprises allowances issued in California
Source: Refinitiv EIKON/Datastream (EU ETS and UK ETS) and ICE exchange (RGGI and WCI)

The recent price increase in all four markets can therefore be interpreted as a reaction to the global political commitment to combatting climate change and incentives to help ETS markets to mature and maintain a steady price for carbon emissions[14]. This will ensure high costs for emitting GHG emissions, which will contribute to the transition towards carbon neutrality.

Capital Charges for Carbon Certificates Imposed by the FRTB are Too High from a Risk Perspective

As noted in the previous paper, the FRTB will increase capital costs for banks participating in the carbon certificate market. In particular, the analysis shows the following two aspects of the FRTB would increase capital costs:

1. **High risk weights of carbon certificates**: Under the FRTB, carbon certificates have been allocated a risk weight bucket of 60% – among the highest of all commodities (eg, twice that of crude oil);
2. **Penalization of carry positions**: In contrast to Basel 2.5, netting is not possible, meaning buying spot and selling forward entails a capital charge.

It is therefore important to assess whether the tightening of financial regulation for carbon certificates is justified from a risk perspective – ie, whether it is proportional to the underlying risk of

[14] This analysis only uses data up until end-December 2021 (mid-February 2022 for the UK ETS) and therefore does not fully consider the volatility in the first quarter of 2022 due to the conflict in Ukraine

trading carbon certificates. This is important as high capital charges could impede the ability of banks to act as intermediaries in carbon certificate markets.

Examining data for the EU market, ISDA's earlier analysis found the FRTB would result in inappropriately high capital requirements for carbon certificate trading.

Risk Weights of Carbon Certificates

The designated risk weights – and therefore the capital charge – of securities are closely related to the implied volatility. The rationale is that the higher the volatility of the security, the higher the capital charge to cover losses in a market downturn. Therefore, the risk weights should be based on the observed asset volatility. As a simple example, if it is estimated that a security will lose 30% of its value in a severe market downturn before a dealer can liquidate the asset, the capital charge should be equivalent to that 30%. This expected shortfall depends on the volatility of the asset – higher volatility implies a higher capital charge.

Previous Findings for the EU Market

In the previous report on the EU ETS market, ISDA found that the volatility of EUAs is well below the volatility levels underlying the FRTB risk weights. In particular, the analysis indicated a stressed period of volatility of 56% in the EU ETS market, implying a risk weight of 37% as opposed to 60%.

New Results for the Two North American Markets and the UK ETS

To assess the appropriate level of risk weights for carbon certificates on a global level, ISDA estimated average GARCH volatilities in the RGGI and WCI markets over a one-year period[15]. To account for the higher volatilities during stressed periods, the highest average volatility over a continuous one-year window is calculated. The RGGI market exhibited the highest volatility between January 2016 and January 2017, whereas volatility peaked in the WCI market between December 2020 and December 2021. This results in a stressed period of volatility for carbon certificates of around 33% and 20% in the RGGI and WCI markets, respectively. This is significantly lower than in the EU ETS market (a stressed period of volatility of 56%)[16].

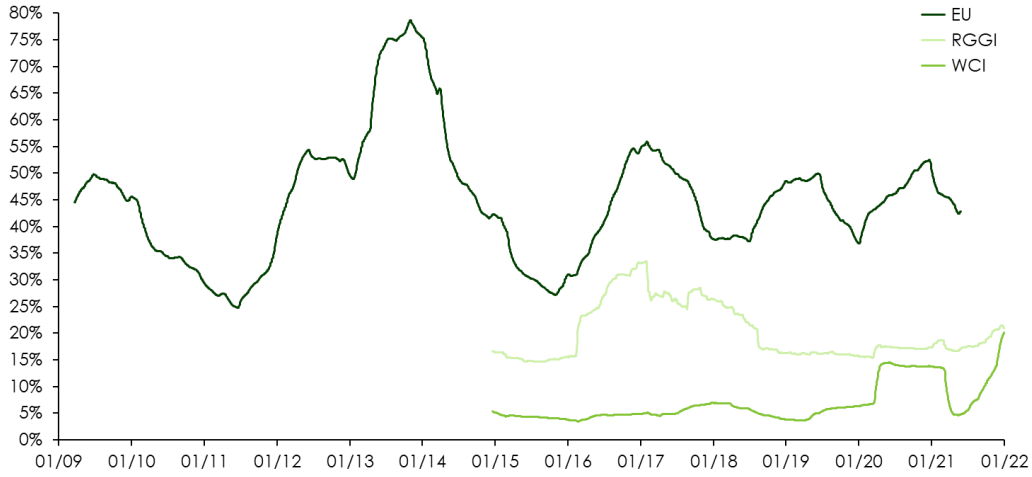
Prices in the UK ETS market are only available since June 2021, meaning the time series only spans 187 trading days until the end of December 2021. Annualized moving average GARCH volatilities in the UK market therefore cannot be calculated. However, calculating volatilities in the UK ETS based on the period when prices are observable results in an annualized volatility of 44%[17]. This is lower than the stressed period volatility in the EU market.

[15] When calculating volatilities, ISDA interpolates prices for days on which no transaction occurred by assuming the price equals the price of the previous trading day. This primarily occurred in the beginning of 2013 when the two North American markets were still in their early stages of development

[16] www.isda.org/a/i6MgE/Implications-of-the-FRTB-for-Carbon-Certificates.pdf

[17] Annualized volatility in the UK ETS is calculated by computing the standard deviation of returns multiplied with the square root of the number of trading days in a year (252 days)

Figure 3
Annualized Moving Average GARCH Volatilities



Note: The volatility estimations are based on the following daily data series: EUAs: ICE ECX continuous one-month future price series. Due to lacking data on certificate trades issued in Quebec and Nova Scotia, the WCI market only comprises allowances issued in California

Source: Own calculation based on data on daily and December EUA futures from Bloomberg, as well as data on one-month futures from ICE exchange

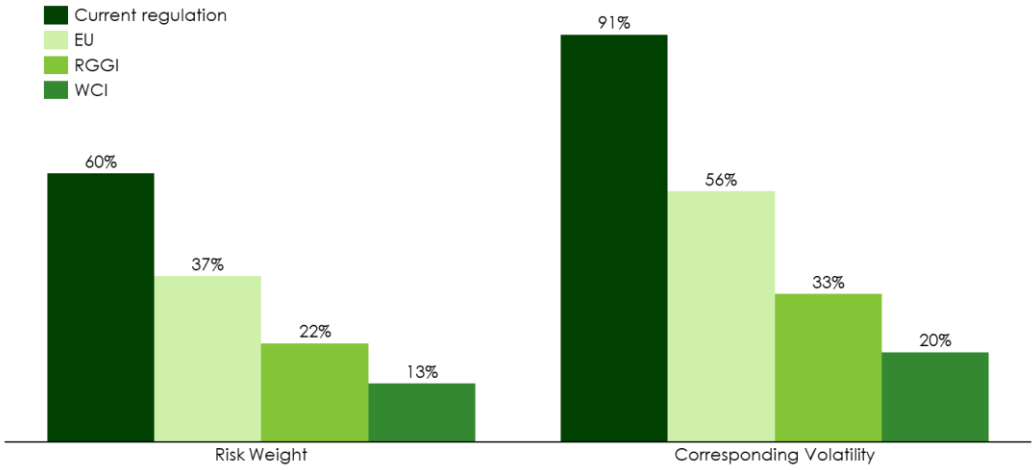
Under the FRTB framework, banks should be able to cover losses in an extreme market downturn in the period that it typically takes to sell or hedge a position (known as the liquidity horizon). For carbon certificates, a 20-day liquidity horizon is prescribed for the internal model approach. Based on estimated volatilities in the RGGI and WCI markets, the implied risk weights would equal to 22% and 13%, respectively[18].

Since the EU ETS market is by far the most developed market – in terms of size, trading volume and maturity – ISDA proposes that the appropriate risk weight for carbon certificates should be based on the higher volatility in the EUA market (56%). This results in a risk weight of 37% for carbon certificates, which is less than two thirds the risk weight of 60% that is currently prescribed.

A risk weight of 37% would significantly reduce capital charges for banks operating as intermediaries in the ETS market. Specifically, the 23-percentage-point risk-weight reduction would imply a drop in the capital charge of close to 40% (disregarding spillover effects to other parts of the portfolio).

[18] $Risk\ weight \approx 2.33 * \sigma_{252} * \sqrt{\frac{LH}{252}}$ (for further details on the methodology used to convert the volatility into a risk weight, please see www.isda.org/a/i6MgE/Implications-of-the-FRTB-for-Carbon-Certificates.pdf)

Figure 4
Risk Weights and Corresponding Volatilities in ETS Markets



Note: Volatilities reflect the highest average volatility over a continuous one-year window. Due to lacking data on certificate trades issued in Quebec and Nova Scotia, the WCI market only comprises allowances issued in California

Source: Own calculation based on daily and December EUA futures from Bloomberg, as well as data on monthly futures from ICE exchange

2. Penalization of Carry Positions

An appropriate risk weight for carbon certificates is particularly relevant in combination with the penalization of carry positions under the FRTB. The framework introduces a correlation factor less than one for positions of different maturities, meaning market participants cannot offset opposite spot and forward positions of the same commodity. This has implications for banks as they carry out their role as intermediaries in the ETS market by taking carry positions (ie, buying spot and selling forward).

It seems reasonable that carry positions for commodities are generally subject to a capital charge. Most commodities are physical, meaning carry positions entail storage costs. These storage costs can fluctuate, meaning spot and forward positions are not perfectly correlated. Therefore, buying spot and selling forward is not a perfect hedge for most commodities. Under the FRTB, a correlation of 0.99 between spot and forward for commodities is assumed as a result.

However, carbon certificates are not typical commodities as there are no physical storage costs, meaning spot and futures positions should be more closely correlated than for other commodities. Hence, buying spot and selling forward is a stronger hedge for carbon certificates than for other commodities.

Previous Findings for the EU Market

In the earlier report, ISDA assessed the correlation between spot and futures contracts in the EU ETS market and identified a correlation of 0.996. This is based on daily and end-of-year futures, which are common carry positions in the EU market. This high correlation between EUA spot and

futures markets is also corroborated by an academic study from 2020[19] that identified a correlation of 0.9999 between 2013 and 2018, suggesting the correlation of 0.99 under the FRTB is not reflective of the EU ETS market.

New Findings for the Two North American Markets and the UK ETS

In the RGGI and WCI markets, carry positions involving one-month and 12-months futures are more common. This is because data is not available on spot prices (in contrast to the EU markets) and 12-month futures are more prevalent than end-of-year futures. For these contracts, the analysis indicates correlations of 0.995 and 0.993, respectively (see Figure 5). If the less common end-of-year position is used instead, the analysis shows a correlation of 0.977 and 0.991, respectively[20].

In the UK ETS, the correlation between daily futures and end-of-year futures (December 2022) corresponds to 0.997 (see Figure 5). This is based on price observations since June 2021 until the end of December 2021. The observed correlation is slightly higher than the observed correlation in the EU ETS market and therefore supports ISDA's previous findings.

The relatively lower correlation in the North American markets versus the EU ETS is not surprising. As these two markets are less mature and exhibit low trading volumes, single transactions can significantly impact the correlation. ISDA therefore recommends using the observed correlation in the EU ETS market as a benchmark to assess capital charges for carbon certificates.

Under the FRTB, a slightly higher correlation makes a big difference. Assuming a typical carry position, the implied capital charge will decline by almost 40% when assuming a correlation of 0.996 in the medium correlation scenario compared to the 0.99 correlation prescribed in the FRTB[21].

Discussion on the correct correlation parameter can also be seen in light of the simplified standardized approach, where full offsetting for stock financing (physical stock being sold forward with the cost of funding locked in) is allowed for commodities (ie, there is no capital charge for carry positions for carbon credit trading)[22]. An equivalent approach is not allowed under the standardized approach.

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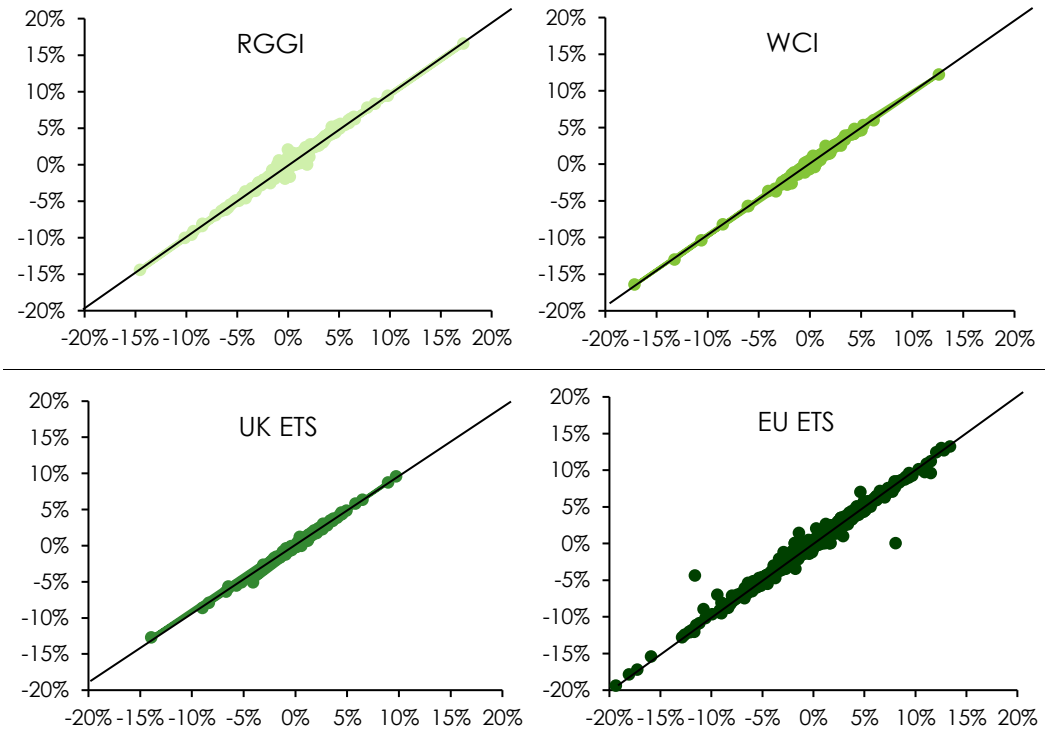
19 Chen et al. (2020) *The Linkages of Carbon Spot-Futures: Evidence from EU-ETS in the Third Phase*

20 ISDA compared one-month and 12-month futures in the RGGI and WCI markets due to a lack of data on daily futures and a very low number of traded futures with an end-of-year maturity. The respective correlation between one-month and December 2021 futures in the RGGI and WCI markets corresponds to 0.977 and 0.991, after excluding one extreme outlier. This correlation is lower than the correlation between one-month and 12-month futures due to the significantly lower number of overlapping trading days and the lower number of transactions with a December 2021 maturity versus 12-month futures. This is important as the prices used reflect the average settlement prices of the respective day, implying that single trades can impact the observed correlation between average transaction prices per day. ISDA therefore suggests using the correlation between one-month and 12-month futures as a baseline

21 When aggregating the sensitivities-based method capital requirement, the low correlations scenario has been applied (resulting in the largest capital requirement)

22 See MAR40.65, footnote 25

Figure 5
Correlation Between Returns to Short-term and Long-term Futures



Note: The figures display the correlation between one-month futures and 12-month futures in the RGGI and WCI markets and the correlation between daily futures and end-of-year futures in the EU ETS (December 2021) and UK ETS (December 2022). Due to a lack of data on certificate trades issued in Quebec and Nova Scotia, the WCI market only comprises allowances issued in California. In the UK, data is only available since June 2021

Source: Own calculation based on data on daily and December futures from Bloomberg (EU ETS) and Refinitiv EIKON/Datastream (UK ETS), as well as data on one-month and 12-month futures from ICE exchange (RGGI and WCI)

Overall, this analysis confirms that ISDA's recommendations for the EU market are also applicable in a global context. ISDA therefore suggests a risk weight of 37% and a tenor correlation of 0.996 for carbon certificates, implying a 60% reduction in capital requirements.

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In this note, we have supported ISDA by providing the analytical foundation of the findings, including the impact of the FRTB regulation, functioning of the carbon credit market as well as the volatility and correlation estimations.

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