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**MODELLING THE MARKET PRICE
OF RISK FOR EMISSION
ALLOWANCE PRICES**

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Summary

About the authors

Dipl. math. Ya Wen joined the chair of energy trading and finance at the University of Duisburg-Essen and began his PhD study since 2011. He is working as a research fellow on the BMBF project “Analytics and Empirics of Emission Trading (AEET)” sponsored by the German Federal Ministry of Education and Research with the research topic “linking schemes”, which focuses on a stochastic model approach to obtain price dynamics for permits in different linking scheme design. His current research aims to study the implied volatility and banking value of permits. Before this Ya graduated from the University of Heidelberg with a diploma in mathematics.

Prof. Rüdiger Kiesel heads the chair for “Energy Trading and Financial Services” at the University Duisburg-Essen. Previously he has been Director of the Institute for Mathematical Finance at the University of Ulm. He also held positions as Lecturer and Reader for actuarial science and financial mathematics at Birkbeck College, University of London and London School of Economics, where he is still visiting professor. He is also a Visiting Professor at the Center for Mathematics for Applications, Oslo University. His main research areas are currently risk management for power utility companies, design and analysis of Emission Trading Schemes, valuation and hedging of derivatives (interest-rate, credit- and energy-related), methods of risk transfer and structuring of risk (securitization), and the stochastic modelling of financial markets using Lévy-type processes. He is Co-author of the Springer Finance monograph Risk-Neutral Valuation (now in its second edition) and has written more than fifty published research papers. He is a frequent speaker at international conferences and organized several practitioner seminars. Professor Kiesel also consults financial institutions and regulators on (credit- and energy-) risk management, derivative pricing models and asset allocation.

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Abstract

MODELLING THE MARKET PRICE OF RISK FOR EMISSION ALLOWANCE PRICES

In the European Union Emissions Trading System (EU ETS) banking of allowances reduces compliance costs and increases the present value of future abatement benefits. Because banking allows regulated firms to maximise the future value of their allowances, it contributes to an increased interest from these firms that the EU ETS should continue and succeed. In this way, banking can prevent the collapse of allowance prices (as seen during the first phase of the EU ETS). Banking can also improve market performance by contributing to market depth and liquidity, while also reducing price volatility. These effects are possible because inter-temporal flexibility through banking can accommodate a longer time span of activity that determines the allowance prices.

The literature on banking in emissions trading mainly focuses on banking strategies and the impact of banking on firms' compliance costs and general benefits. The effect of banking on the price of allowances has been considered very little.

As emission allowances are traded on the market, their price paths carry information on the market participants' expectations about the development of the fundamental price drivers and the regulatory framework itself. In particular, prices of allowance futures and options contracts carry forward-looking information which can be extracted by using appropriate valuation models.

In our research project we propose an allowance pricing model and calibrate it to the market of the European Union Allowances. Our aim is to extract an forward-looking estimate for price components which are linked to the assessment by market participants of future EU ETS development such

as the banking value. So far, the pricing model is discussed under the setting of a single compliance period market. In order to capture the effects of the banking value on the permit prices, we will extend the pricing model to a multi-period setting. This will improve the accuracy of the model and will allow to study the size and the dynamics of the banking value as judged by the market participants. We will evaluate this implied banking value for different contract maturities and assumptions on the regulatory framework. The implied banking value provides an insight into the market participants' view of the permit availability in the current and subsequent trading periods, which plays an important role for today's market design.

