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Dr Riccardo Rebonato is Global Head of Market Risk and Global Head of Quantitative Research at The Royal Bank of Scotland (RBS). He holds Doctorates in Nuclear Engineering and in Solid State Physics. He is a Visiting Lecturer at Oxford University in Mathematical Finance and is the author of several books and academic papers on the topic. He sits on the Board of The International Swaps and Derivatives Association (ISDA) and of GARP (Global Association of Risk Professionals). He has written several books including: "Volatility and Correlation: The Perfect Hedger and the Fox [Wiley Finance, 2004], "Modern Pricing of Interest-Rate Derivatives: The LIBOR Market Model and Beyond" [Princeton University Press, 2002] and "Volatility and Correlation in the Pricing of Equity, FX and Interest Rate Options" [John Wiley & Sons, 1999]. Previously, Dr Rebonato was Director and Head of Research at BZW - originally part of Barclays - within the Financial Products Group. Prior to BZW he was Research Fellow in Physics at Corpus Christ College, University of Oxford. He has published papers in several academic journals in finance and is a contributor to The Handbook Of Risk Management and Analysis.

The Application of Real Option Theory to Strategic Energy Choices

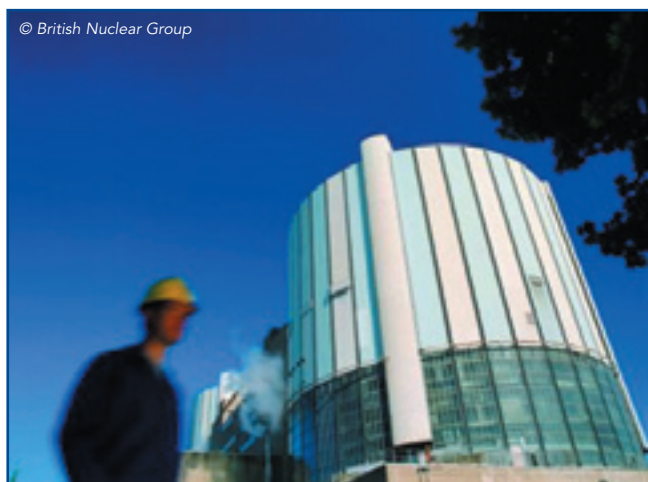
We are currently facing great uncertainty regarding the extent, the origin and the potential impact of climate change and global warming. Similar uncertainties are present in the geopolitical environment linked to the international supply of energy. The governments and the electorates of countries worldwide are faced with difficult choices between reliance on oil, (re-)development of nuclear energy or investment in alternative 'cleaner' technologies (wind, solar, geothermal, etc). Part of the debate is based on the economic viability and effectiveness of the alternatives. There are, of course, other dimensions to the problem, but the evaluation of the economic relative desirability of the several options is an important part of the decision-making process. Looked at in this light, the decision between the various energy alternatives is yet another instance of investment budgeting.

The classic approach to investment budgeting recommends discounting future cash-flows at the 'appropriate' rate, comparing the 'present value' of these cash flows with the upfront cost of the investment, and choosing accordingly. The difficulty of the approach, it is said, mainly relies in determining the appropriate rate of discounting, and most of the asset pricing and corporate finance theories boil down to different specifications of how this should be done. A new approach, called the real option theory, has recently received a lot of interest. According to this line

of thought we should factor among the benefits of undertaking a certain course of action the decisional flexibility it may afford as our information about the future increases. It seems to me that the strategic energy choices, and the nuclear option in particular, are an area that screams for real option theory to be applied.

To understand why this should be the case, it is useful to remind ourselves of the situations where the real-option approach brings the greatest benefits. First we must be in a situation of great uncertainty (the value of an option increases with 'volatility'); second, the cost of reversing a decision or of changing a course of action must be high; third, we must be in a situation where there is no single choice that can best handle the uncertainty of the problem (the option must be roughly 'at the money').

It is easy to see how these conditions are easily met in the case of the energy choices we are faced with at the moment. The volatility of the energy landscape is self-evident. Changing a course of action is very costly: if we were to decide tomorrow that nuclear energy is the way to go, we would have to wait for 5 to 10 years for the newly-commissioned plants to become operational. And the uncertainty as to be the best way forward is clearly great (the option is 'at the money').



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What does real option theory suggest in these situations? One of the main insights it provides is that a traditional discounted-cashflow analysis is woefully inadequate when uncertainty between alternatives is great, in that the optionality value (the time value of the option) is likely to be very large, and it is automatically destroyed by decidedly going for one alternative over the other. This high value of the choice option can easily reverse a traditional budgeting decision. The theory also suggests that there is a high hidden cost (in destroyed optionality value) if choices are made that are difficult to reverse. In sum, real option theory provides the commonsensical answer that judging competing projects using traditional budgeting tools (ie, choosing the alternative with greatest present value) is inadequate in situations of high uncertainty, and that 'keeping one's (real) options open' not only makes intuitive sense, but also gives the theoretically and practically correct answer.

I am not aware of any real-option studies published on the energy alternatives, and I think this would be a worthwhile field of study. I would confidently venture to speculate, however, that the result of such a study would be that there is great value, at the moment, in exploring and investing in a wide variety of alternatives, especially when, as in the nuclear case, a negative decision would be very costly, difficult and time-consuming to reverse.

Riccardo Rebonato

Thought leadership in action

Formidable economic challenges and seismic geopolitical shifts are inherent in today's energy markets. Our business rationale is to respond to these and predict their impact on governments and institutions, enabling them in turn to face the consequences. Working with our partners and associates, and using our unrivalled in-depth experience in energy markets, we lay out the true difficulties the energy sector is likely to face, looking far beyond current trends.

But the true value of strategic thinking is in its application, and our thought leadership underpins everything we do. An extensive range of clients have already benefited from our innovative and risk-managed solutions, including banks, government agencies, private equity specialists, power suppliers, generators and investors.



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- energy market regulation and compliance.
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Contact us

T: +44 (0) 118 959 0261

F: +44 (0) 118 939 3385

M. +44 (0) 7833 954 817

W. www.globalenergyadvisory.com

E. ailey@globalenergyadvisory.com

A. Global Energy Advisory Ltd
3 Wesley Gate
Queen's Road
Reading
Berkshire RG1 4AP

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