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LNG MARKET LIQUIDITY, SECURITY AND STRATEGIC ARBITRAGE

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Overview
With the advent of a growing and increasingly 'flexible' LNG trade as well as an expanding array of technologies for building the LNG supply chain East and West of Suez, "LNG Market Liquidity" remains an elusive concept for new players – including major utilities, regulators and policy makers – as well as for well-informed and experienced traders with proprietary information. In this context, the notion of "security of supply" for a liberalizing and expanding European marketplace with diverse 'rules of the game' for allocating rights to capacity and the respective elements of LNG and pipeline projects provides a challenge to the economics profession:

to develop a consistent methodology for quantifying the value and cost of alternative specifications of 'market liquidity';

to develop testable models for evaluating the efficacy of alternative 'market liquidity' regimes for ensuring 'security of supply'; and

to develop market designs for the liberalization of integrated energy markets across borders – by land and sea – that exploit the capacity of strategic arbitrageurs and differentially informed players to contribute to a well-integrated market that can be relied upon for secure energy supplies under a diverse range of potential economic and political challenges to security of supply.

Methods
The paper illustrates how the methods of financial economics for differentiating among diverse elementary contingent claims such as 'rights to buy' (call options) vis-à-vis 'rights to sell' (put options) are fundamental to developing a constructive foundation for the design and valuation of 'destination rights', 'market liquidity' and 'security of supply' (defined as a package of short- and long-term contingent claims analogous to a form of 'mutual insurance' in contrast to 'reserves-based insurance'). These methods provide the building blocks for integrating the analysis of LNG market liquidity in the context of an integrated energy supply infrastructure; including diverse means of supply such as gas trunklines, storage and, ultimately, renewable energy sources. The interaction of diverse agents with differing expectations and risk aversion is captured by employing a very robust methodology for modeling the demand for portfolio insurance in a context of investors having 'safety-first' preferences (for security of supply and down-side risk mitigation) as well as a demand for retaining claims on up-side reward capture and the gains to strategic arbitrage in a dynamic energy-trading portfolio environment.

Principal Results & Conclusions
The rigorous definition of 'destination rights' along with a compatible regime for allocating such rights – as packages of contingent claims (respective short- and long-term rights to buy and sell supplies and/or the accompanying supply capacity) through an integrated supply chain comprises a form of 'mutual insurance' among diverse parties.

The distinction between 'mutual insurance' and 'reserves-based insurance' is fundamental to the design of an integrated market for the provision of 'supply security' in a dynamic and uncertain environment.

LNG market liquidity is a valuable asset to the development of a secure energy network including natural gas (integrating a network of land-based and seaborne trade) and

renewables as well as other sources of supply. Technologically, the modularity and scalability of LNG technology is particularly conducive to the phased development of an integrated and 'liquid' market over time.

LNG market liquidity, as such, is a valuable asset. There is 'no free-lunch' for market liquidity and alternative market design rules based on the building blocks of 'destination rights' yield more – or less – efficacious bounds on the potential for 'mutual insurance' in mitigating supply risks.

As a paradigm for market design, the principle of 'mutual insurance' – based on trade in contingent claims – yields a fundamentally different perspective from that of 'reserves-based insurance' on the most plausible necessary conditions for ensuring 'supply security' in a dynamic environment in which liquidity is a valuable asset and in which diverse players have different market and political expectations and risk preferences.

The relative market positions of 'safety-first' traders vis-à-vis those of strategic arbitrageurs is an important determinant of the cost of ensuring a given level of market liquidity and, thus, security of supply.

References

Arrow, K.J. (1975). "Vertical Integration and Communication," Bell Journal of Economics, 6: 173-185.

Baldwin, C.Y., and K.B. Clark (2000). Design Rules: The Power of Modularity. (Vol. 1) MIT Press.

Binmore, K., and P. Klemperer (2002). "The Biggest Auction Ever: The Sale of the British 3G Telephone Licenses," Economic Journal, 112(278): C74-C96.

Brunnermeier, M.K. (2001). Asset Pricing under Asymmetric Information: Bubbles, Crashes, Technical Analysis, and Herding. Oxford University Press.

Carr, P. (1988). "The Valuation of Sequential Exchange Options," Journal of Finance, 43(5): 1235-1256.

Dixit, A.K. (1989). "Entry and Exit Decisions under Uncertainty," Journal of Political Economy, 97(3): 620-638.

Dixit, A.K. (1992). "Investment and Hysteresis," Journal of Economic Perspectives, 6(1): 107-132.

Dixit, A.K., and R.S. Pindyck (1994). Investment under Uncertainty. Princeton University Press.

Fischer, S. (1978)."Call Option Pricing when the Exercise Price is Uncertain, and the Valuation of Index Bonds," Journal of Finance, 33(1): 169-176.

Gennotte, G., and H. Leland (1990). "Market Liquidity, Hedging, and Crashes," American Economic Review, 80(5): 999-1021.

Grenadier, S.R. (1996). "The Strategic Exercise of Options: Development Cascades and Overbuilding in Real Estate Markets," Journal of Finance, 51(5): 1653-1679.

Jensen, J.T. (2003). "The LNG Revolution," The Energy Journal, 24(2): 1-45.

Jensen, J.T. (2004). The Development of a Global LNG Market: Is it Likely? If so, When? Oxford Institute for Energy Studies (NG 5).

Kreps, D.M. (1990). Game Theory and Economic Modeling. Oxford University Press.

Krugman, P. (1989). Exchange Rate Instability. MIT Press.

Leland, H.E. (1978). "Optimal Risk Sharing and the Leasing of Natural Resources, with Application to Oil and Gas Leasing on the OCS," Quarterly Journal of Economics, 92(3): 413-438.

Leland, H.E. (1980). "Who Should Buy Portfolio Insurance?" Journal of Finance, 35(2): 581-594.

Leland, H.E. (1996). "Options and Expectations," Research Program in Finance, Working Paper No. RPF-267, Walter A. Haas School of Business, UC Berkeley.

Margrabe, W. (1978). "The Value of an Option to Exchange One Asset for Another," Journal of Finance, 33(1): 177-186.

Marshall, J.M. (1974). "Insurance as a Market in Contingent Claims: Structure and Performance," The Bell Journal of Economics and Management Science, 5(2): 670-682.

McMillan, J. (1994). "Selling Spectrum Rights," Journal of Economic Perspectives, 8(3): 145-162.

McMillan, J. (2003). "Market Design: The Policy Uses of Theory," American Economic Review, 93(2): 139-144.

Merton, R.C. (1973). "Theory of Rational Option Pricing," Bell Journal of Economics and Management Science, 4(1): 141-183.

Merton, R.C. (1998). "Applications of Option-Pricing Theory: Twenty-Five Years Later," American Economic Review, 88(3): 323-349.

Nissen, D., and D. Knapp (2005). "Oil Market Reliability: A Commercial Proposal," Geopolitics of Energy, 27(7): 2-6.

Parsons, J.E. (1989). "Estimating the Strategic Value of Long-Term Forward Purchase Contracts Using Auction Models," Journal of Finance, 44(4): 981-1010.

Pickett, G.G. (1999). "An Economic Analysis of Several 'Real Options' Embedded in Integrated Land-based and 'Seaborne' Trunklines for Natural Gas and LNG," IAEE Annual International Conference Proceedings, Rome, June 9-12, 1999.

Pickett, G.G. (1999). "An Option Valuation Model for Options on Capacity in Integrated Landbased and 'Seaborne' Trunklines for Natural Gas and LNG," IAEE: USAEE Annual North American Conference Proceedings, Orlando, Florida, August 29-September 1, 1999.

Pickett, G.G. (2007). "Strategic Design and Valuation of LNG Tournaments," Paper presentation at the 30th IAEE International Conference, Wellington, New Zealand, 18-21 February, 2001.

Porter, D., Rassenti, S., Roopnarine, A., and V. Smith (2003). "Combinatorial Auction Design," Proceedings of the National Academy of Sciences, 100(19): 11153-11157.

Rassenti, S.J., Smith, V.L., and K. McCabe (1994). "Designing a Real Time Computer Assisted Auction for Natural Gas Networks," in: W.W. Cooper and A.B. Whinston (eds.), New Directions in Computational Economics, 41-54, Kluwer Academic Publishers.

Smit, H.T.J., and L. Trigeorgis (2004). Strategic Investment: Real Options and Games. Princeton University Press.

Stulz, R.M. (1982). "Options on the Minimum or the Maximum of Two Risky Assets: Analysis and Applications," Journal of Financial Economics, 10(2): 161-185.

Titman, S. (1985). "Urban Land Prices under Uncertainty," American Economic Review, 75(3): 505-514.

Verleger, P.K., Jr. (1993). Adjusting to Volatile Energy Prices. Washington, DC: Institute for International Economics.

Vickrey, W. (1961). "Counterspeculation, Auctions, and Sealed Tenders," Journal of Finance, 16: 8-37.

Wilson, R. (2002). "Architecture of Power Markets," Econometrica, 70(4): 1299–1340.