Natural Gas Markets in Asia: Recent History and Potential Developments

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Some recent developments in the LNG markets
Increasing fraction of spot and short-term trades

Source: International Group of Liquefied Natural Gas Importers (GIIGNL)
Increasing numbers of LNG traders

Source: GIIGNL
Spot trading versus number of buyers

Spot Frac = 0.19174 ln(Regas) – 0.60722; \( R^2 = 0.9324 \)

Source: GIIGNL
Spot and re-export trades are longer distance

Sources: Author calculations based on GIIGNL and VesselDistance.com
Recent evolution of spot natural gas prices

Source: Platts
US LNG imports relative to marketed production

Source: US Energy Information Administration (EIA)
Japanese LNG imports: Long-term contract and other

Source: GIIGNL
Other recent developments

- LNG swaps and other spot trades increasingly are aimed at exploiting arbitrage opportunities rather than compensating for force majeure episodes
- Many regasification terminals are adding storage capacity to support arbitrage
- Expiration of long-term contracts for some early liquefaction developments has created spare capacity and without a need to finance large investments
  - More of their output is being sold short-term and spot
- Many recent contracts have greater volume flexibility, and less than 100% off-take commitments by buyers
Other recent developments

- After the EU restructuring directive of 1998 (promoting competition in EU gas markets), the Commission found destination clauses anti-competitive in 2001
  - This stimulated re-export of cargoes and increased destination flexibility
- Growth of “portfolio LNG” sourced from many sellers and sold to many buyers
- Interest in LNG in Eastern Europe to provide competition for Russian gas
  - Intent seems to be to reduce prices, not import large volumes on a long-term basis
Effects of US developments on LNG trade

- The first few US terminals are proposing exports under a tolling arrangement
  - Typical feed gas price 115% of Henry Hub and liquefaction fee $3–3.50/mmbtu
  - Several buyers are adding the LNG to their global portfolios
- Some proposed facilities are smaller and more modular than traditional trains
  - Along with the ability to use infrastructure previously built for regasification terminals, this reduces the financing requirements
- Future co-location of regasification and liquefaction facilities in the US with pipeline connections to a deep market will facilitate short-term arbitrage
- US projects may be well-suited to play a strategic role in European gas markets
The value of long-term LNG contracts in an uncertain environment
Explanations for long-term contracts

- We focus on two main explanations for the desirability of long-term contracts:
  1. The hold-up problem
  2. Securing a lower cost of finance by reducing cash flow variability

- Commercial parties emphasize the risk sharing benefits of contracts, but the academic literature has focused on the hold-up problem

- The academic literature has also focused on the efficiency benefits of take-or-pay clauses in long-term contracts
The hold-up problem

- This can occur when trading partners make large up-front investments dedicated to the trade partnership.
- Once investments are made, the counter-party has an incentive to bargain for prices covering operating costs but not yielding a competitive return on capital.
  - This incentive for opportunism can also apply to re-negotiating an indexation formula.
- The problem can become more acute if some information is known only to one party, so the rents associated with the relationship are not public knowledge.
- Contracts often allow more quantity adjustments than price adjustments.
  - Price adjustments are zero-sum, while quantity adjustments leave the other party with alternative avenues for making up lost profits.
Rent in the contracting relationship

- The next best price for the buyer $p_M$ and the next best price available to the seller $p_X$ will vary randomly.
- Parties in a long-term contract tend to be better matched to each other than to outside parties.
- The contract price will tend to be toward the top of the $p_X$ distribution and the bottom of the $p_M$ distribution.
- While the two contracting parties generally are better off trading with each other that may not always be true.
Take or pay clauses

- In the situation illustrated, the importer would prefer to buy spot rather than honour the contract.
- But it would be efficient to buy from the exporter since they would both be better off trading at a price between \( p_X \) and \( p_M \) than both using the spot market.
- A take-or-pay clause requires the importer to make the exporter “whole”, that is pay \( p - p_X \) to the exporter, if the contracted volume is not taken.
- Then the buyer would choose to not take delivery only when \( p_M < p_X \) in which case this is efficient.
- But the take or pay clause also leads to a transfer from the buyer to the seller in situations like the one illustrated.
Model of long-term LNG contracts

- Key idea: A long term contract is “bankable” because it makes cash flows less volatile
- This in turn allows increased leverage, and reduces the cost of project finance
- The total amount of debt is limited by a “value at risk” type constraint:
  - The constraint requires an upper bound on the probability that the random after-tax cash flow will be insufficient to service the debt in any given year
- In addition, parties may want to limit volumes under long term contract in order to retain more flexibility to exploit profitable spot market trades
The bilateral long-term contract has the following features:

- There is a contract price \( p \) paid by the buyer at the importer’s location (\( p-S \) paid at the exporter’s location) and a contract volume \( q \).
- The supplier must deliver \( q \) unless both parties agree to a lesser amount.
- Importer taking \( M < q \) when \( p_X < p-S \) pays \( (p-S-p_X)(q-M) \equiv \varphi(q-M) \) to the exporter, where \( \varphi + p_X = p-S \).
- The exporter can fulfill contracts with swaps or sell surplus production spot.
- The importer can re-export \( q \) spot or supplement \( q \) with spot market purchases.

The contract terms \( p \) and \( q \) maximize the sum of the expected NPV of profits of importer and exporter.

The contract has to be *incentive compatible* in the sense that both parties
- Obtain positive expected NPV from the contract; and
- Prefer the contract outcome to expected NPV under trade without a contract.
The long-term contract makes both parties strictly better off on average by allowing more debt finance

- In the numerical examples, the combined surplus is about 30% higher

Contracts can enable trade where it would not otherwise be supportable

Contracts are more valuable when there is “rent” in the relationship

The benefits of extra debt exceed the final gains in net present value, so there are partially offsetting losses from inefficient ex-post trades mandated by the contract terms

While contracts preclude some profitable trades, they also bestow an option value

- Both parties use spot transactions to supplement long-term contract trades
- By limiting long term contract volumes parties retain more flexibility to exploit profitable spot market trades

Increased spot price variability generally raises the benefits of long-term contracts

General increases in spot prices are indexed 85–90%
Indexing in long-term contracts

- Energy *relative* prices tend to be much more stationary than the prices of individual energy commodities
  - For demand, energy content is the dominant determinant of value, although energy density, ease of handling, environmental effects and other attributes are relevant
  - For supply, resources that can be used to produce natural gas in particular can also be used to produce oil and relative output shifts in response to relative prices
- Many studies have shown that oil prices tend to be the *most exogenous* energy price in markets where both prices are free to fluctuate independently
- Natural gas prices are the *most volatile* fossil fuel price (next slide)
- US natural gas prices have looked more attractive recently because the foreign exchange value of the $US has affected the oil/gas price ratio (see later slides)
  - After US LNG is traded, US gas prices may be a less attractive index to Asian buyers
- Other spot natural gas markets need to become sufficiently deep and liquid to reduce risks to investors in these large capital intensive projects
- Indexing to natural gas hub prices may exchange geographical basis differentials for commodity basis differentials
Rolling 28-day standard deviations of log prices
February 2009 – May 2015

Source: Author calculations based on data from the US Energy Information Administration (EIA)
Influence of exchange rate on long run relationship between Brent and Henry Hub

- Long-run relationship includes relative heat rates and foreign exchange value of the $US
Within sample fit of the dynamic model

- Adjustment to long-run error is approximately 6% per month
- Unexpected inventory changes have about 2x the effect on prices as expected ones
- HDD and CDD deviations and major hurricanes have expected effects on $\Delta \ln(p_{NG})$
More traders give more elastic supply and demand curves and reduce LNG spot price volatility

Intermediaries providing hub services and having access to storage will allow more effective price arbitrage, further reducing price variability

The gap between spot prices available to importers and exporters will decline as market liquidity rises

Spot market trades from parties to contracts should continue to increase

Greater use of spot and short-term trading may favor lower capital cost projects

Growth in spot trading may reduce volumes under contract and raise spot market participation, further raising spot market liquidity

Long-term contracts will also become more flexible to allow parties to better exploit the optionality of spot and short-term trades

The exogeneity of oil prices suits them as the main indexing variable for long-term contracts, but limited use of gas price indexes from deep natural gas markets might provide some risk diversification benefits