LNG Trading Risk Management

[Market & Volumetric Risks]

Presented By

Xavier Veillard
APAC Director
Trading, Investments & Optimization Strategy Group

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Our Trading, Investments & Optimization Strategy Group supports LNG trading-focused organizations optimize their portfolio, trading, performance and risk management capabilities

**Accenture Trading, Investments & Optimization Strategy [TIOS] Group**

- Our TIOS Group is based in primary energy trading centres globally, serving clients on their portfolio trading strategy to enhance value captured from global energy markets

**TIOS Scope of Advisory Services**

- **Trading and Risk Management**
  - Portfolio optimization & structuring
  - Trading strategy & book forensic analysis
  - Risk analytics and @ risk
  - Target trading operating model design
  - Trading solution design / implementation

- **Investment Valuation & Financial Structuring**
  - Asset and corporate investment valuation
  - Contract / financial structuring
  - Joint venture / joint business structuring
  - Assets carve out & segmentation

- **Commercial Optimisation**
  - Market outlook development
    - Supply / demand / market forecasting
  - Competitor analysis / benchmarking
  - Value chain integration
  - Pricing optimisation and analytics
Content

LNG Trading Risks Overview

Conclusions
We approach LNG Trading Risks by focusing on market and volumetric risks through a comprehensive approach from risks identification to management and mitigation ...

Source: Accenture Analysis

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Content

LNG Trading Risks Overview

Identifying Key LNG Trading Risks

Managing Key LNG Trading Risks

Conclusions
The LNG short-term / Spot market has expanded in recent years, highlighting willingness of buyers to increase their portfolio exposure to volumetric risks...

Note: Spot & short-term LNG trades include trades under contracts of a duration of 4 years or less

Sources: Accenture Analysis, GIIGNL

Spot & Short-term LNG Trade [MTPA and Cargo Count] and Share of Total LNG Trade [%]

- Cargo Count [#]
- Volume [MTPA]

Increase in spot volumes from excess uncommitted production

LNG spot & Short-term decrease from global economic slowdown

% of Total LNG Trade

- 2007: 19%
- 2008: 18%
- 2009: 16%
- 2010: 19%
- 2011: 25%
- 2012: 25%
- 2013: 27%
- 2014: 29%
... which will result in global players having a higher mix of spot / short-term supplies in their portfolio to manage flexibility and volumetric uncertainty.

**Spot / Term Mix Outlook of LNG Imports for Selected Countries [% Spot/ Short-term* Trade of Total Trade]**

<table>
<thead>
<tr>
<th>Country</th>
<th>World</th>
<th>Asia-Pacific</th>
<th>Japan</th>
<th>Korea</th>
<th>China</th>
<th>India</th>
<th>Taiwan</th>
<th>Singapore</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>18%</td>
<td>19%</td>
<td>19%</td>
<td>16%</td>
<td>12%</td>
<td>20%</td>
<td>6%</td>
<td>15%</td>
</tr>
<tr>
<td>2025E</td>
<td>21%</td>
<td>23%</td>
<td>24%</td>
<td>18%</td>
<td>14%</td>
<td>22%</td>
<td></td>
<td>26%</td>
</tr>
</tbody>
</table>

Note: *Spot LNG trades include trades under contracts of a duration of approximately 2 years or less.
Sources: Accenture Analysis, GIIGNL
Additionally, LNG contracts through volumetric tolerance, BO / Fuel usage option and call / put embedded contractual options also add to general volumetric risks.

### LNG Portfolio Structure – Examples of Trade Patterns and Volumetric Optionality

<table>
<thead>
<tr>
<th>Option Ownership</th>
<th>Volume Impact</th>
<th>Sell/Short Side</th>
<th>Portfolio Activities</th>
<th>Buy/Long Side</th>
<th>Volume Impact</th>
<th>Option Ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>☺</td>
<td>↑</td>
<td>Locked-in LT SPA Contract</td>
<td>Back-to-back with tolerance option</td>
<td>Locked-in LT SPA contract</td>
<td>↑</td>
<td>☺</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Locked-in LT FOB SPA Contract</td>
<td>Portfolio Optimization, Sourcing, Re-routing, Cargo Swaps, Swings</td>
<td>Locked-in LT DES SPA Contract</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>↓</td>
<td>Locked-in LT Contract &amp; short call option</td>
<td>Back-to-back with additional option</td>
<td>Locked-in LT Contract with long call option</td>
<td>↑</td>
<td>☺</td>
</tr>
<tr>
<td></td>
<td>↑</td>
<td>Locked-in LT Contract &amp; Short put option</td>
<td>Back-to-back with cancellation option</td>
<td>Locked-in LT contract with long put option</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spot Producer</td>
<td>Spot Deals</td>
<td>Spot Buyer</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** LT: Long-Term; ST: Short-Term  
*Sources: Accenture Analysis*
As portfolios diversify their supply sources and long/short-term mix, exposure to market price curves is expanding with the latter annualized vitality averaging 35%+

Sources: Accenture Analysis, Thomson Reuters

Global LNG Prices [$USD/mmBtu]

- Fukushima-driven price increase
- Decline in oil prices & Asia Oversupply

Global LNG Annualized Volatility [%]

- UK Cols Snap
- Shoulder month demand change & Pipeline congestions

Sources: Accenture Analysis, Thomson Reuters
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Exposures of the portfolio to multiple price curves through physical and financial positions creates different level of market risks horizons...

Illustrative Gross and Net Physical and Paper Volume Exposure of Portfolio by Market Curve

- **A** Quarter-Ahead Exposure
- **B** Part-Year Ahead exposure
- **C** Long-term Exposure

Source: Accenture Analysis

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... and the level of correlations between portfolio market price curves will lead to a resultant exposure which will be different than individual curves exposures

<table>
<thead>
<tr>
<th>Absolute Price Curve Correlation Analysis [Trailing Twelve Months]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brent</strong></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td><strong>Oil</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Gas</strong></td>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Currency</strong></td>
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<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

Sources: Accenture Analysis, Thomson Reuters
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Shortage or Excess of LNG as a result of portfolio volumetric risks exposure need to be accurately modelled, with the associated risks premium value quantified...

**Volumetric Risks Exposure Modelling and Management**

<table>
<thead>
<tr>
<th># of Cargoes</th>
<th>Sell/Short Side</th>
<th>Buy/Long Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y+1 Total Contracted Sales Volume</td>
<td>c.50</td>
<td>c.50</td>
</tr>
<tr>
<td>Potential Shipment Decrease from Options Sold</td>
<td>c.3</td>
<td>c.4</td>
</tr>
<tr>
<td>Potential Shipment Increase from Options Sold</td>
<td>c.5</td>
<td>c.1</td>
</tr>
<tr>
<td>Y+1 Total Committed Sales Volume</td>
<td>c.8</td>
<td>c.3</td>
</tr>
<tr>
<td>Y+1 Total Contracted Purchase Volume</td>
<td>c.50</td>
<td>c.47</td>
</tr>
<tr>
<td>Additional Demand from Industrial Customers</td>
<td>c.1</td>
<td></td>
</tr>
<tr>
<td>Demand Reduction from Retail Customers due to Weather Change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y+1 Total Potential Purchase Volume</td>
<td>c.50</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Accenture Analysis*
LNG SPA contractual terms should be leveraged as a mean of managing portfolio volumetric risks, optimizing owned options vs. premium value of option costs.

### Key Volumetric Contractual Considerations for LNG SPA

**Main Volumetric Terms**
- **Volume Commitment**
  - ACQ, DCQ for volume commitment, ADP, NDP, TDP and other delivery program for delivery volume scheduling
  - Tolerance band for X% of base volume with min & max volume commitments, make-up / carry forward term, operational tolerance
  - Call option to secure incremental volume / cargoes at fixed or preferred price formula, right to cancel cargo delivery
  - ACQ determination, round-up & round-down quantities, minimum & maximum ACQ

- **Tolerance and Take or Pay Penalties**
- **Embedded Call / Put Options**
- **Additional Volumetric Terms**

**Other Terms**
- **Volume Swing / Swap / Diversions**
  - Clause to swing/swap gas volume or LNG cargoes; cargo diversion options with profit sharing agreement
- **Location / Incoterm Options**
  - Option to fix FOB/DES term of sale and to nominate destination port vs. fixed loading / unloading port

**Accenture TIOS Volumetric Risk Modelling & Management Approach**

- **Quantification of Volumetric Risks**
- **Assessment of Volumetric Risk Cost vs. Premium Costs**
- **Portfolio & Contract Structuring**
- **Assessment of Structuring Costs vs. Premium Costs**
- **Validation of Risk Mgt. Approach**

*Source: Accenture Analysis*
Potential deviation in expected P&L from LNG Sales/Purchases activities and related upstream / downstream activities need to be quantified to maximum margin deviation

### Forward Monthly P&L Projection [\$m]
- Market Risk - NBP
- Market Risk - HH
- Market Risk - Fuel Oil
- Market Risk - JCC & Brent
- Remaining MtM P&L

### P&L at Risk and Risks Limits
- **Expected P&L Uncertainty with +/- 1.65\sigma [95% Confidence Interval]**
- **95% Confidence Interval P&L @ Risk**
- **Maximum margin deviation**
- **Margin to protect through Hedging & Risks Mgt.**
- **Planned P&L for Business Year**
- **Minimum P&L expected with Risk Exposures**
- **Minimum P&L expected from Business Plan & Financing Activities**

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Source: Accenture TIOS Analysis
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Selecting and structuring the hedging strategy requires a careful quantification of basis risks for the different instruments available to hedge...

### Potential Hedging Market Instruments for LNG Trading [Excluding Embedded Optionalities]

<table>
<thead>
<tr>
<th>Market Type</th>
<th>Timing</th>
<th>Settlement Type</th>
<th>Example Contracts</th>
<th>Key Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exchange</td>
<td>Futures [Prompt to Year ahead]</td>
<td>Financial</td>
<td>Dated Brent Swaps</td>
<td>Cross Hedging</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Financial with Physical settlement option</td>
<td>Brent Oil Futures</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical</td>
<td>Henry Hub Gas Futures</td>
<td></td>
</tr>
<tr>
<td>OTC</td>
<td>Forward [Prompt to Year ahead]</td>
<td>Financial</td>
<td>JKM Swaps</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Financial with Physical settlement option</td>
<td>TTF Gas Forward</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical</td>
<td>Brent Oil Forwards</td>
<td></td>
</tr>
</tbody>
</table>

**Legend**

- Less Mature → More Mature
- Less Risky → Riskier

**Source:** Accenture TIOS Analysis

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... And ultimately, the market risks management strategy should support reduce short-term earnings risks, facilitating business and capital financing plans.
Overall, we recommend an integrated approach to LNG volumetric and market risks, ensuring alignment between risks capital provisions and actual risks exposures.

High-level Accenture Approach to LNG Risk Management Execution

**Risk Identification**
- Market Fundamentals & Outlook Analysis
- Portfolio Curves & Positions Exposure

**Risk Management**
- Risk Modelling & Simulation
- Risk Mitigation Strategy

- Spot/term mix and portfolio trade structures
- Historical & planned portfolio positions
- Portfolio margin at-risk quantification
- Risk monitoring, setting and control

- Price curves dynamics, volatility and outlook
- Portfolio LNG contract terms & conditions
- Portfolio parameters stress-test simulation
- Exposure limit setting and hedging execution

**accenture** TIOS Capabilities and Assets for LNG Risk Management

- Integrated Position Reporting & Risks Mgt. Model
- LNG Performance Mgt. Model
- LNG Trading Risks Market Fundamentals Analysis

Source: Accenture TIOS Solutions
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