OPTIMAL GAS SOURING STRATEGY FOR RETAILERS IN OPEN MARKETS

OIL-INDEXED CONTRACTS VS. TTF IN THE NETHERLANDS

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1. Background

Gas retailers require large volumes of gas each year to fulfil their commitment to serve customers. Given the absence of upstream assets, this effectively requires securing access to gas with flexibility in the volume amounts.

In many European countries, like the Netherlands, most of gas needs are usually met primarily by one state controlled gas provider, like GasTerra/Gasunie (GT) and a handful of long-term supply contracts. It is important to assess whether such an approach continues to be viable, given the gradual opening of the European gas market.

Relying exclusively on bilateral long-term contracts raises the risk of being locked into high-price and/or rigid contractual terms. This induces gas retailers to take advantage of increasing market liquidity by entering into structured contracts with market exposure.

As such, an optimal gas souring portfolio can be conceived as a mix of open market structured contracts and bilateral agreements, in an integrated marketing/trading approach. This approach would allow efficient hedging of established long-term positions and optimal trade-off between liquidity and security of gas supplies.

In order to assess risk and return within this approach, a more detailed understanding and comparison of:

1. *Product Offerings*: what are the various GT products available on the market and how do their main risks and advantages compare to third-party purchases?
2. *Price Offerings*: how do the prices of these GT products compare to TTF, considered as fair market value for third-party contracts? and
3. *Key Characteristics of the retailer Gas Needs*

is primordial.

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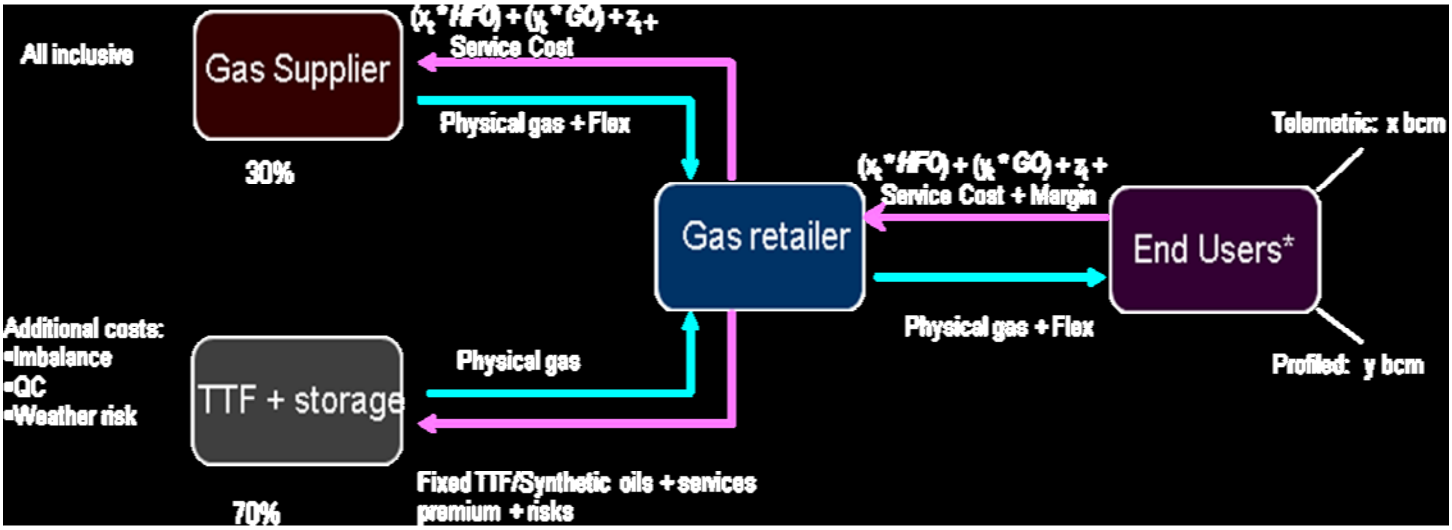
For illustration purposes, we will take 2007 as an example and compare actual gas results for a Dutch gas retailer that year to what the results would have been under alternative gas sourcing strategy.

The diagram below summarizes the trade-off a gas retailer faces when sourcing gas:



2. Aims and Objectives

Key objectives of this paper are to:

1. Address the benefits and trade-offs of open markets in the development of natural gas resources, stating the implications on gas retailers;
2. Explain how much value a Third-Party gas sourcing strategy in open markets can generate for a gas retailer, and why;
3. Show how these results stack up against what a more traditional bilateral agreement with state controlled organizations would have generated;
4. Compare key risk differences between the two approaches, in particular in relation to weather; and
5. Explain how the gas sourcing strategy may need to change in order to adapt to an increase in open markets products and offering.

3. Methodology

We start by comparing various open market and products from risk and reward perspective. We provide a breakdown of the cost by type and by market segment for a chosen year. Since temperature deviations lead to deviations from expected gas demand, we estimate this weather risk based on a 30-year history of temperature and compute its impact on the cost.

The resulting cost distribution under different sourcing strategies (GT and TP) is then used in a stochastic optimization to determine the optimal portfolio allocation between GT and TP. The trading strategy is described in simple rules and the resulting P&L is discussed.

3.1. Product Comparison

With the liberalization of gas markets in the Netherlands, various gas forward contracts with different characteristics and corresponding cost structures are traded. GasTerra (GT) provides contracts with some flexibility for different customer segments (KVS: retail residential, GVS: B2B and Regional: rural areas). Third party gas (TPG) contracts are also available, generally with lower initial costs but bear more risk. The table below summarizes the main alternative sources of natural gas available to gas retailers in the Netherlands, along with their key characteristics:

	GasTerra			Third Party
	Regional	**KVS**	**GVS**	
Segment	Retail	Retail	B2B	Various
Pricing Formula	Gasoil	x Gasoil + y HFO + z (xyz formula)	x Gasoil + y HFO + z (xyz formula)	Various Reference market is TTF
Transport included?	Yes	Yes	Yes	No
Flexibility included?	Yes	Yes	Yes	No
Temperature protection?	Yes	Partial	No	No
Main Advantage	- Includes significant flex - Provides full weather protection	- Usually cheaper than regional - Provides some flex and partial weather protection	- Usually cheaper than regional - Provides some flex	- Often cheapest option - Full flexibility on resale, destination, storage, etc.
Main Disadvantage	- Typically most expensive - Cannot be resold - Strict destination rules, leaving little flexibility to Gas retailer	- Cannot be resold - Strict destination rules, leaving little flexibility to Gas retailer	- Cannot be resold -Strict destination rules, leaving little flexibility to Gas retailer - No weather protection	- Requires access to flex - No weather protection

Sourcing from third parties in open markets requires:

1. Trading capability to manage market price risk;

2. Expertise in pricing/managing gas transportation;

3. Good demand forecasting; and

4. Access to flex capacity (storage or flexible upstream contracts) to manage volume and temperature risk.

The main choice between GasTerra and third party sourcing boils down to a trade-off between:

- A usually relatively expensive source (GasTerra) with strict restrictions on the ability to resell or redirect gas, but providing good protection against temperature risk and not requiring separate access to flex capacity; and

- Third-party sources priced against TTF which provide excellent flexibility but require separate access to flex capacity if demand is fluctuating and also leave gas retailers exposed to weather risk.

3.2. Weather Risk Estimation

The Third-Party strategy does not offer the same degree of protection against weather risk as a GT strategy would (for example, the warm winter would result in a reduction of the gas retailer's profits). This risk arises from actual gas demand (primarily from retail customers) deviating from expected levels if temperature deviates from normal.

Under a third-party sourcing strategy, sourcing volume is fixed and the gas retailer can therefore find themselves with:

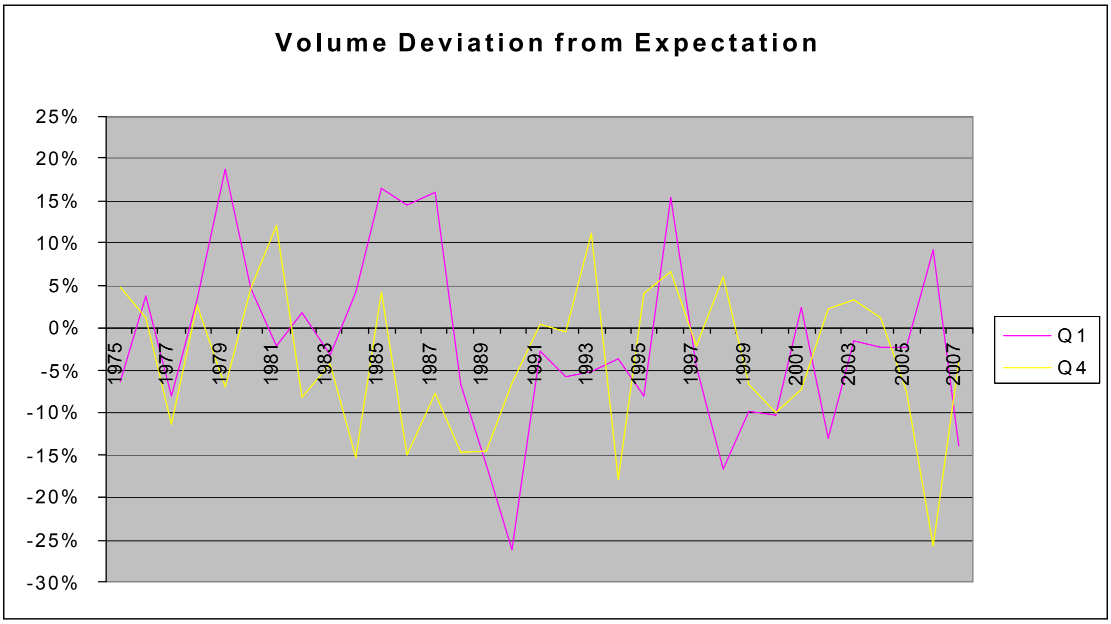
(i) either a shortage of gas at a time of high gas prices if winter temperatures are lower than expected; or

(ii) an excess of gas at a time of low gas prices if temperatures are higher than expected.

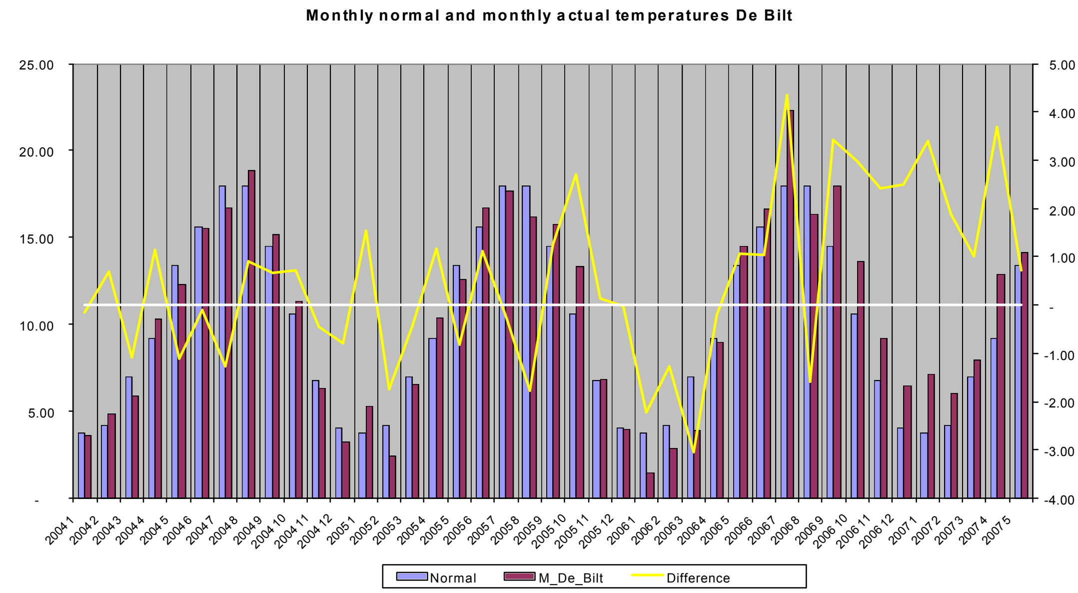
By comparison, GT Regional sourcing (and to some extent KVS sourcing as well) allows for adjustments in volume if the temperature deviates too much from normal.

As a result, under the TP strategy, it is very important for gas retailers, not only to get access to flex capacity (through storage or flexible upstream contracts) and manage price risk through trading, but also to come up with the best possible temperature/load forecast.

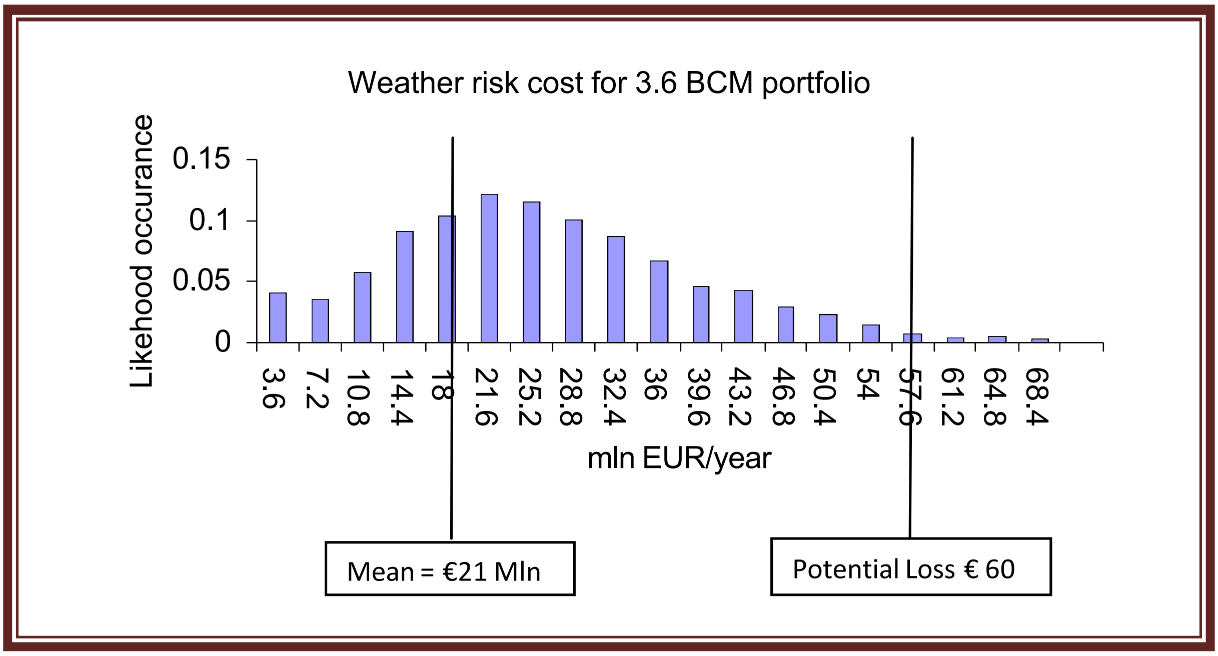
Temperature deviations lead to deviations from expected gas demand. The graph below illustrates historical load deviations from expectations for Q1 and Q4 of the last 30 years. Using this data, it is possible to estimate the weather risk taken through a TP strategy.



Using a more recent data set, the following graph shows that deviations can reach as high as 4 degrees and as low as -3 degrees.



For a portfolio equal to 3.6 bcm, and assuming that load deviations of more than 2.5% from expectations would require buying/selling extra gas on the market at an additional cost of Euro 10/MWh, the distribution of possible losses per year is given below.



Taking into account temperature deviation in year 2007, the graph above shows that the 2007 potential loss constitutes a tail event, with only a 1.5% chance of occurrence in a given year.

3.3. Estimation of different cost components

When sourcing gas from GT, there are 2 cost components:

- Commodity cost
- Service cost (includes flex cost)

When sourcing gas from TPG, 5 cost components are identified:

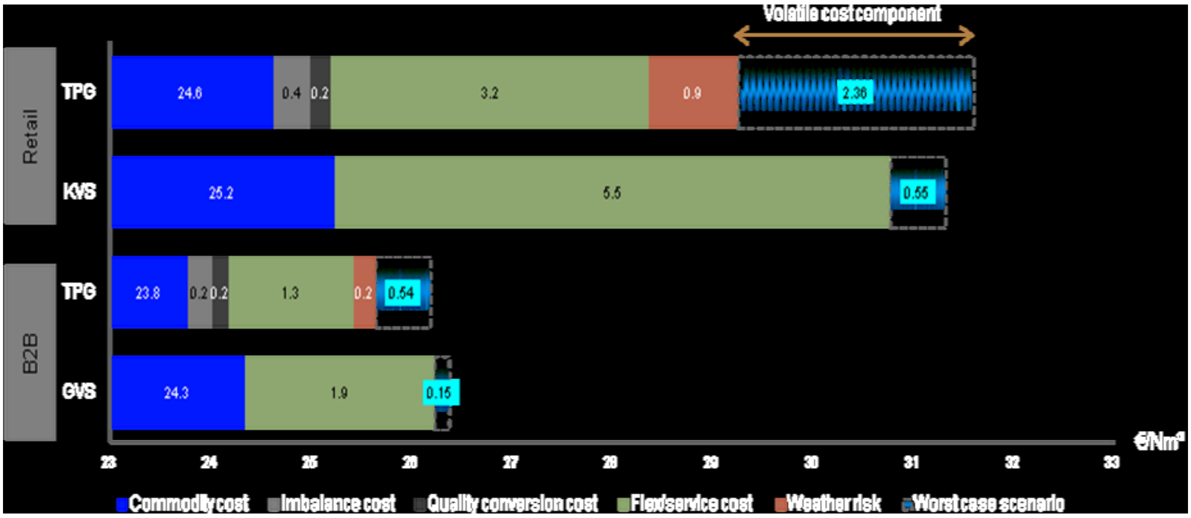
- Commodity cost
- Flex cost
- Imbalance cost
- Quality conversion
- Seasonal/weather risk

The table below details cost components for various market segments for year 2007.

Expected	Retail		B2B	
EurCts/Nm³	TTF (Monthly)	KVS	TTF (Monthly)	GVS
Commodity Cost	24.63	25.24	23.77	24.34
Imbalance Cost	0.36	-	0.24	-
QC Cost	0.21		0.17	
Flex/Service Cost	3.17	5.53	1.25	1.88
Seasonal Weather Risk Cost	0.88		0.21	-
Total Cost	**29.24**	30.78	**25.64**	26.22
advantage for TPG	1.53		0.58	

Worst Case Scenario	Retail		B2B	
EurCts/Nm³	TTF (Monthly)	KVS	TTF (Monthly)	GVS
Commodity Cost	24.63	25.24	23.77	24.34
Imbalance Cost	0.41	-	0.26	-
QC Cost	0.22		0.18	
Flex/Service Cost	3.74	6.08	1.33	2.03
Seasonal Weather Risk Cost	2.61		0.64	-
Total Cost	31.61	**31.32**	**26.18**	26.37
advantage for TPG	-0.29		0.19	

This results in a cost distribution described in the plot below:



3.4. Proposed Procurement Strategy

The Procurement strategy is based on a two-stage optimization taking into account different market prices and cost structures affecting profit. The spread between TTF and oil-indexed prices is key control variable that determines optimal timing for sourcing gas.

Yearly procurement optimization

Faced with different procurement alternatives, gas retailers have the typical situation of investor's decision making under uncertainty. From the analysis in the previous section, gas retailers have the choice between (relatively) low risk – low return oil-indexed contracts and high risk – high return gas spot markets contracts.

The gas portfolio volume requirements for each year and for each customer segment are estimated by sales channels and are input to this multi-year stochastic optimization scheme.

Each year cost distributions are estimated based on historical load profiles for each customer segment. The yearly revenues from each sales channel are obtained by simulating xyz factors and HFO, GO prices, taking into account current forward curves. xyz factors are simulated at both times of buying (sourcing gas) and selling (to sales channels), thereby taking into account time spread risk.

The portfolio overall cost (C) and revenue (R) are respectively the present value of the costs and revenues for each year in the future. The optimization's objective is to maximize the risk-adjusted expected profit:

$$Max\left\{\frac{\text{mean}(R - C)}{30\% \times \left[\text{mean}\ (R - C) - P_{95}(R - C)\right]}\right\}$$

The divisor, mean(Profit) – P_{95}(Profit), is sometimes called the Value-at-Risk, since it measures the difference between the portfolio expected profit and the potential loss. The multiplier 30% in the denominator is a possible value of the RAROC, reflecting the company's risk aversion. The higher the RAROC value, the higher the risk aversion. The output of this optimization is depicted in the figure below:

Cost Breakdown	*1y year contract*	*2y years contract*	*3y years contract*	*4y years contract*	*10y years contract*
KVS commodity cost	25.24	25.21	25.25	25.27	25.26
KVS flex service cost	5.53	5.54	5.55	5.55	5.57
TPG commodity cost	24.20	24.22	24.24	24.26	24.24
TPG flex service cost	3.60	3.60	3.60	3.60	3.60
TPG imbalance cost	0.26	0.26	0.26	0.26	0.26
TPG quality conversion cost	0.23	0.24	0.27	0.22	0.27
TPG weather risk cost	1.81	1.81	1.81	1.81	1.81
Sourced Volume					
KVS	-	4,242	995	7,439	7,324
TPG	-	-	-	-	-
Portfolio Volume per year (Million m3)	4,000	4,000	4,000	4,000	4,000

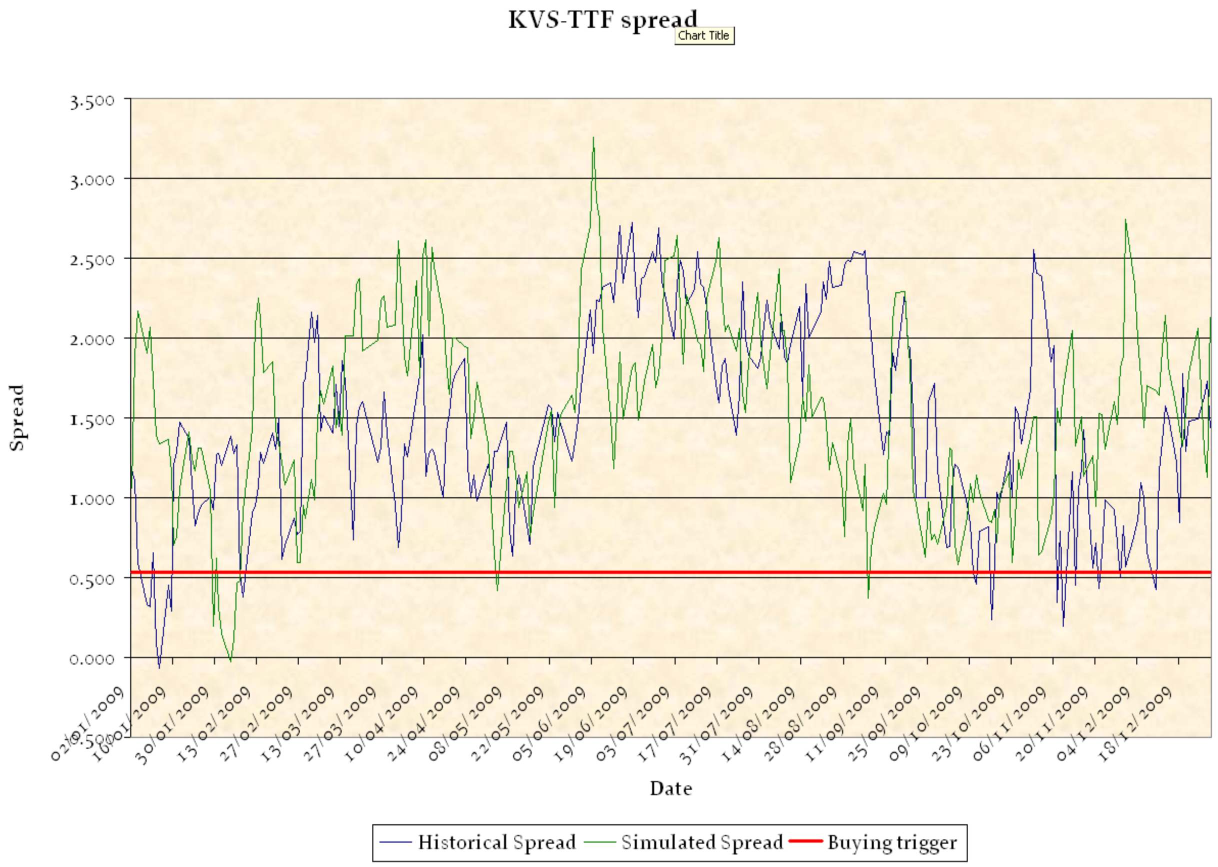
Decision variables	*Volume Purchased y1*	*Volume Purchased y2*	*Volume Purchased y3*	*Volume Purchased y4*	*Volume Purchased y5*
KVS 1y	-				
TPG 1y	-				
KVS 2y	3,514	728			
TPG 2y	-	-			
KVS 3y	-	386	608		
TPG 3y	-	-	-		
KVS 4y	-	272	3,303	3,864	
TPG 4y	-	-	-	-	
KVS 10y	486	2,614	89	136	4,000
TPG 10y	-	-	-	-	-
Portfolio cost per year per Million m3	€ 123,039	€ 123,247.33	€ 123,268.88	€ 123,281.21	€ 123,320.00
PV portfolio cost	€ 467,099				
RAROC	35%				
Mean	€ 467,236				
5%	€ 465,671				
95%	€ 469,386				
Standard Deviation	€ 1,162				
Risk Adjusted Cost	€ 467,643				
RAROC Risk Adjusted	€ 467,988				

Once the actual gas volume allocation is determined from the optimization above, a further optimization is used to source the optimal volumes at profitable prices during the year. Since the GT prices fluctuate throughout the year (floating x, y and z), it is optimal to source gas from GT at times when the spread GT-TTF is low or negative.

A stochastic mean-reverting model is used to simulate the TTF-KVS spread in 2009, 2010 and 2011. Historical prices are used to define the model's parameters: mean-reversion speed and volatilities. A distribution of total purchasing costs over the year is obtained.

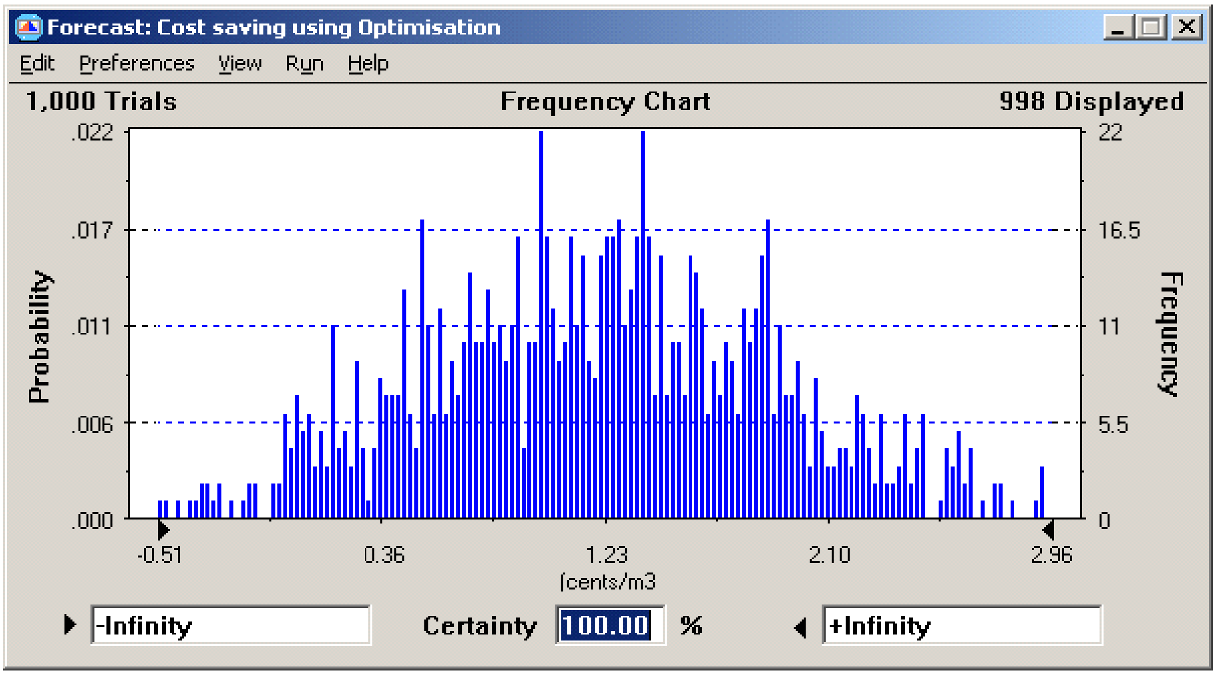
After testing different purchasing strategies, the best approach would be as follows:

- Buy gas every time the TTF-KVS spread deviates from the long-term mean by more than 1.5 standard deviations;
- The volume to be bought at such point should be proportional to the spread and inversely proportional to the time remaining till 30 Nov 2008; and
- If the spread deviates from the mean by more than 3 standard deviations, then the whole remaining volume should be bought immediately.



4. Results

The distribution below shows the resulting potential savings for 2009 only, compared to the traditional bilateral agreement where buying occurs on the last possible day of the year. It shows the mean of savings to equal 1.2 cents/m^3, with a 3% probability of losing money.



On average, this preliminary model suggests that spreading the purchasing decision over the year(s) could result in an improved average purchasing price of 1.2 cents/m^3 if only one year is considered and 1.4 cents/m^3 if purchases are spread over three years. This could lead to savings in the order of **Euros 40 million** per year for a 3.6 bcm portfolio.

Clearly, there are significant risks associated with the strategy:

1. Since early purchase may well result in us locking-in the wrong KVS - TTF spread compared to competitors buying at the last possible moment;

2. Most fundamentally, the model and proposed strategy only hold if GT sticks to its current approach of ensuring that their prices do not deviate too much from TTF, since the whole model rests on the assumption of a mean-reverting KVS – TTF spread.

5. Summary and Conclusions

This analysisis proposed a concrete gas sourcing alternative strategy taking advantage of increased liquidity in open markets. It acknowledges that this third-party strategy would be potentially impacted by the low level of liquidity at most gas hubs in Europe and the resulting high price volatility. However, it demonstrates that this strategy can outperform the traditional bilateral agreement with state controlled companies for gas souring if the portfolio mix is optimized according to corresponding risks.