

Retailers' risk management and vertical arrangements in electricity markets

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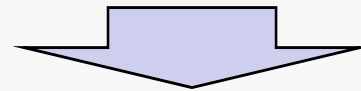
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Agenda

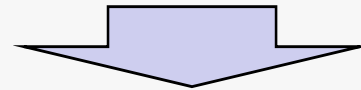
- 1) Paper's research motivation
- 2) The market risks faced by retailers
- 3) The structural limits of contractual hedging
- 4) The merits of physical hedging
- 5) Portfolios' risk profiles analysis

The textbook model of decentralized market

Retail competition was thought to imply the emergence and development of asset light retailers
Innovative contracts, attractive prices



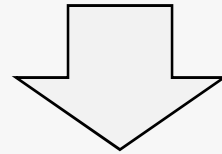
Asset light retailing has never eventuated as expected
New entrants bankrupted, were taken over, or evolved towards vertical integration



Why has this organisational model failed?

Electricity Intermediation and market risks

- Electricity retailers are **specific** market intermediaries
- Real time matching function/vertical imbalances



Quantity risk + Price risk

Demand is stochastic, inelastic, strong short term variability/Supply is rigid
Electricity is economically not storable
Positive load/price correlation

} Volatile
spot prices



Market shares variations

Contractual hedging : expected roles and structural limits

- Theoretical paradigm : contracts (*forward, futures*) are efficient risk management devices and perfect substitutes to physical assets
- Problems of contracts : no mutually beneficial price/quantity mix
 - ✓ Misalignments of price provisions : *ex ante* uncertainty on a fair *ex post* risk sharing/*price squeeze*
 - ✓ Misalignments for quantity preferences
- *Call options* : the miracle solution?

The merits of physical hedging

- Restores symmetry between upstream and downstream in terms of risk exposure (asymmetry in decisions making and in market risk exposure) → Impact on risk hedging incentives
- Quantity risk and price risk are significantly reduced by the physical asset operational flexibility and subsequent option value
- Internalization of costs and risks : vertical arbitrages opportunities in relation with risk's profiles and margins of each segment

Portfolios risk's profile analysis

The paper demonstrates that the risk reducing benefits of physical hedging cannot be reproduced by pure contractual portfolios. Risk measured by VaR for the 95% confidence level.

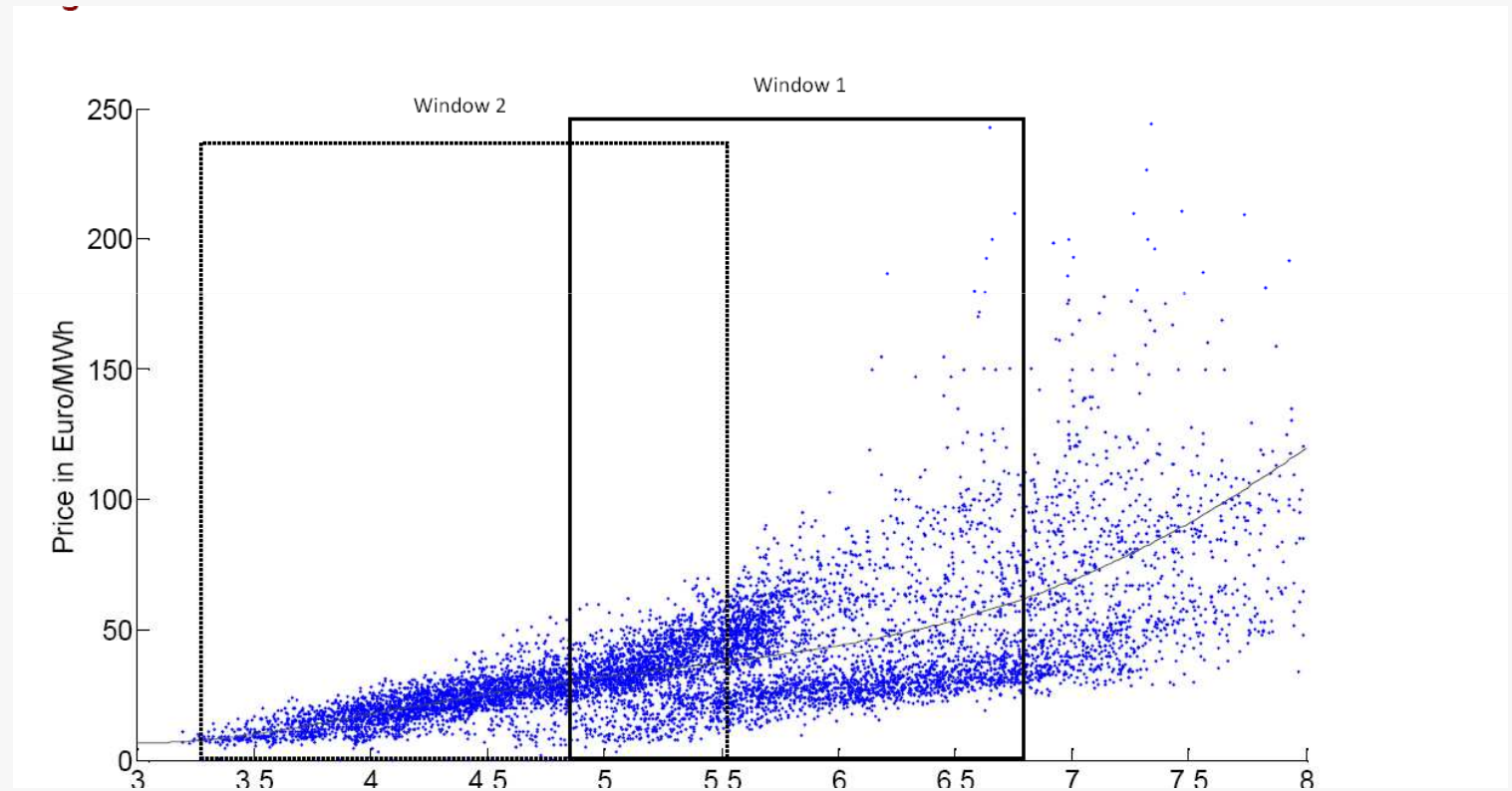
Payoff of the different contracts/assets given the spot price

Contract	Payoff
Retail Contract	$\pi_{retail,t} = -\tilde{P}_t \times \tilde{V}_t + E(\tilde{P}_t \times \tilde{V}_t)$
Forward	$\pi_{forward,t} = V_{forward} \times \tilde{P}_t - E(V_{forward} \times \tilde{P}_t)$
Power Plant	$\pi_{plant,t} = V_{plant} \times \max(\tilde{P}_t - mc, 0) - E(V_{plant} \times \max(\tilde{P}_t - mc, 0))$
Call Option on Spot	$\pi_{call,t} = V_{call} \times \max(\tilde{P}_t - X, 0) - E(V_{call} \times \max(\tilde{P}_t - X, 0))$
Put Option on Spot	$\pi_{put,t} = V_{put} \times \max(X - \tilde{P}_t, 0) - E(V_{put} \times \max(X - \tilde{P}_t, 0))$

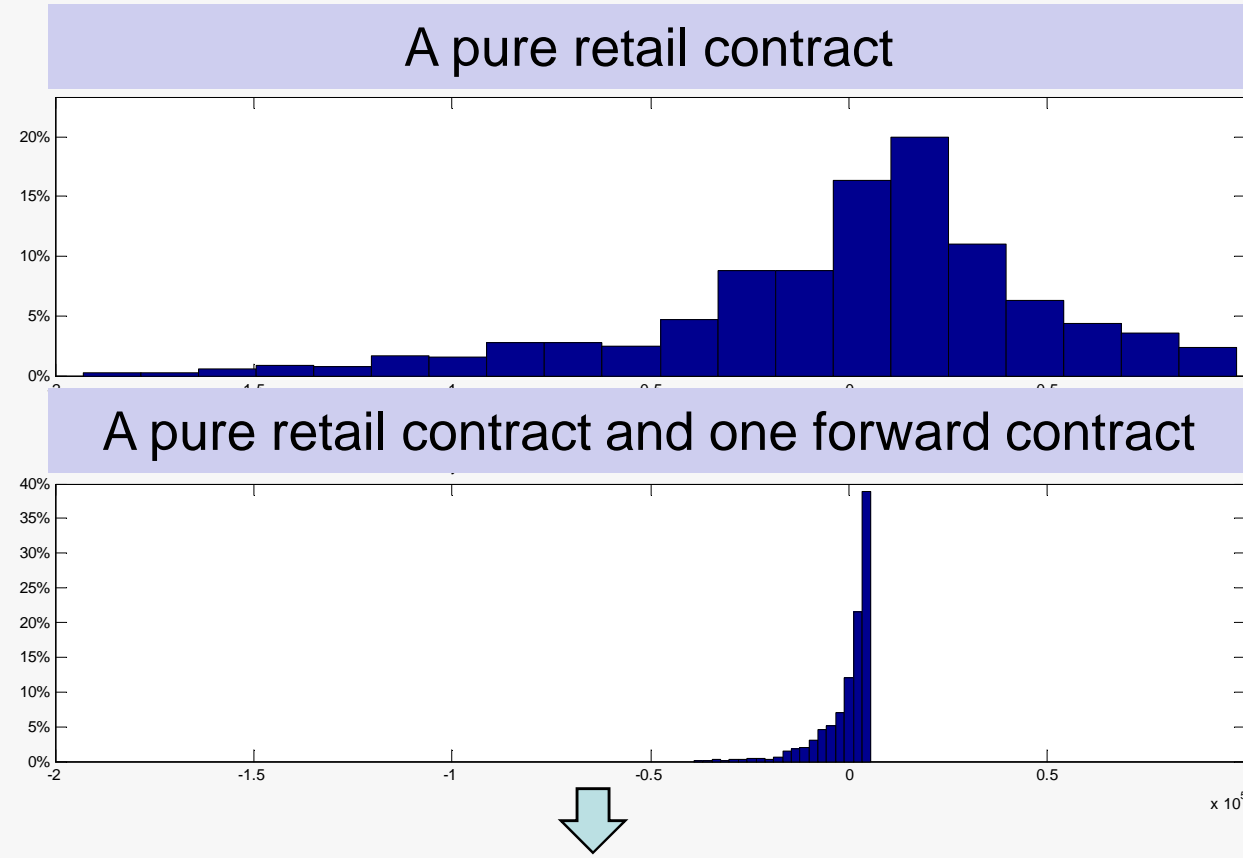
All contracts are settled on the spot market.

French prices and volumes 2007

3000 simulations based on real data from the French market



Payoff distribution of two portfolios



By adding just one forward contract, risk is significantly reduced

Portfolios containing one retail contract that maximize the VaR(95%)

#	Used assets	Retail	$V_{forward}$	V_{plant}	V_{call}	V_{put}	VaR(95%)
1	All contracts	1	-0.04	0.26	1.24	-0.27	-2,088
2	without options	1	0.09	1.33	-	-	-2,131
3	only options	1	-	-	1.47	-0.28	-2,092
4	only forward	1	0.98	-	-	-	-12,942
5	only power plant	1	-	1.46	-	-	-2,201

The objective is to find the portfolio consisting of 1 MWh baseload retail contract and a linear combination of financial contracts as well as physical assets that reduces risk. The factors for the contracts/assets are also measured in MWh.

Portfolios containing one retail contract and different power plants that maximize the VaR(95%)

#	Used assets	$V_{forward}$	$V_{plant,50}$	$V_{plant,25}$	$V_{plant,75}$	VaR(95%)
6	Forward and 3 plants	0.30	0.62	0.00	0.59	-2,112
7	3 plants		1.17	0.22	0.03	-2,141
8	$V_{plant,25}$ and $V_{plant,75}$			0.76	0.75	-2,199
9	Forward and $V_{plant,75}$	0.50			1.09	-2,183

In our example the optimal portfolio (#6) that consists of 0.62 of the normal power plant, 0 of the cheap power plant, 0.59 of the expensive power plant and 0.3 of the forward contract can reduce the VaR(95%) to 2,112. This implies a slight improvement with respect to the optimal portfolio for the normal power plant and the forward contract (VaR(95%)=-2,131).

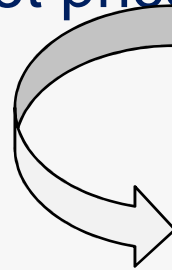
By allowing only power plants it can be demonstrated that adding a power plant with different payoff characteristics might reduce the VaR of the portfolio. (8 to 5, to 7)

Results implications

To hedge against market risks, two approaches :

✓ Combination of forwards and physical assets, VaR decreases by more than 80% compared to « only forwards situation »

✓ Combination of forwards and options on the spot price

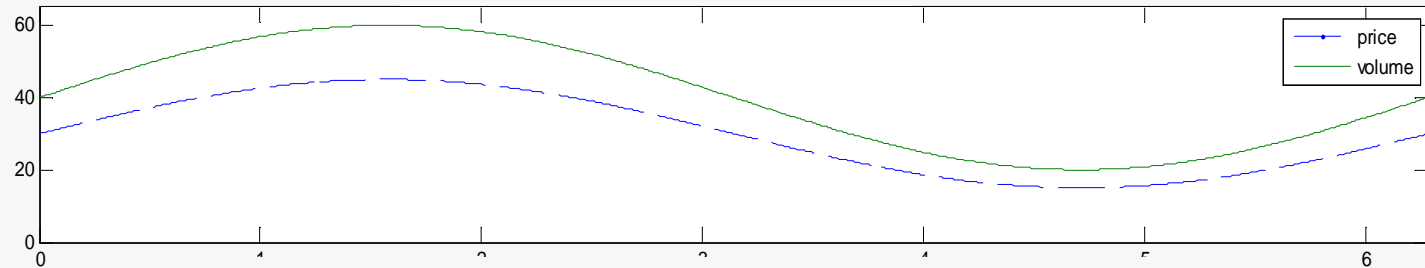


Absence of liquid markets for derivatives makes options not credible choices for retailers...

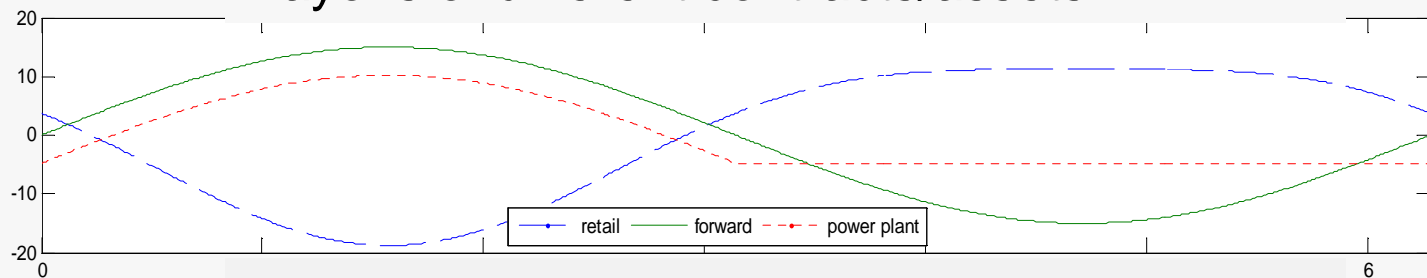
...Vicious circle?

Stylized examples of the necessity of option-like assets in retail portfolios

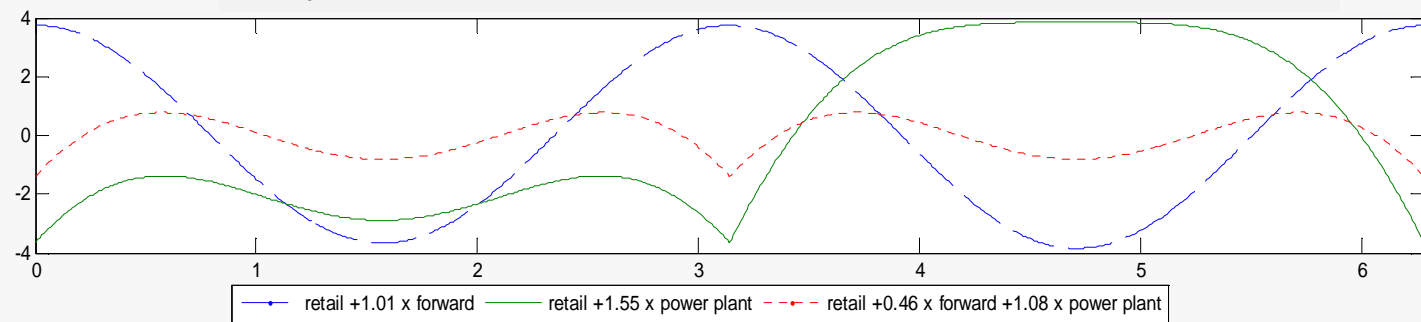
Prices and volumes



Payoffs of different contracts/assets



Payoffs of the optimal portfolios



Conclusion

- ✓ Financial contracts are imperfect substitutes to physical hedging in the current market environment
- ✓ Intrinsic incapacity of the asset light retailing model to manage efficiently market risks
- ✓ Portfolio structure centered upon physical assets to overcome the pure retailer's curse

THANK YOU FOR YOUR ATTENTION