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Signaux-prix et équilibre de long-terme.

Repenser les formes de marchés électriques

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Introduction

Le modèle de référence des réformes et des politiques de la concurrence

Marchés décentralisés et équilibre de concurrence pure et parfaite

Prémisses : prix de marché est supposé permettre articulation court terme/long terme avec liaison intertemporelle des prix

En fait défaillance de marché à cause des particularités du bien-électricité et des défaillances de marché

- Signal prix déficient : ne parvient pas à créer des incitations à l'investissement optimal sur le secteur
  - Insuffissante capacité en pointe
  - Manque d'investissment en équipements capittlaisitique: déformation du mix
  - **Equilibre sous-optimal**

Question: quels arrangements autorisés pour permettre optimum de long terme?

1. Limite de la théorie de l'équilibre de long terme en univers incertain

1.1. Critique génerale de la théorie *standard* de l'investissement en univers incertain (Pindyck & Dixit)

Hypothèse implicite de départ : existence de marchés complets

Rôle central du signal-prix dans la décision d'investissement en environnement incertain.

a. **Représentation probabiliste de l'incertitude**

b. Articulation court-terme / long-terme en posant **une relation inter-temporelle des prix:**

Estimation des flux de recettes en marche aléatoire et de dépenses à partir du prix actuel:

c. **VAN espérée ou bien valeur d'option** (en ajoutant la valeur d'attente)

On aboutit à **un résultat optimal en terme de timing et de dimensionnement** de l'investissement de l'agent considéré

Résultat étendu pour l'ensemble du secteur **en supposant que tous les acteurs de marché anticipent de la même façon**

- **Le prix actuel** **sert de base pour déclencher des décisions optimales d'investissement**

Résultat obtenu au prix de deux hypothèses fortes :

a) Représentation probabiliste de l'incertain (pas de prise en compte de chocs, des transformations profondes offre / demande).

b) Les agents se comportent comme le suppose la théorie des anticipations rationnelles
   - information identique, raisonnement identique.
   - c'est la conditions de convergence des anticipations de prix.

Sans cette hypothèse, possibilités de comportements stratégiques (myopie, mimétisme, etc.) : biais dans les choix d'investissement.

➢ **Si on relâche les deux hypothèses, la relation inter-temporelle des prix ne tient plus.**
Les prix actuels ne disent rien des prix futurs.

La relation inter-temporelle des prix, en théorie, restaurée par les marchés financiers?

- Avec instruments de couverture (*forward, futures*) : l'investisseur couvre ses risques en garantissant des revenus sur longue période.

Mais ce n'est pas le cas:

les *futures et forward* réellement échangés courent sur des horizons courts dans toutes les industries (elec < 3 ans)

CCL

- **Utilité limitée des signaux-prix (prix actuels) pour orienter / guider les investissements.**
  - Problème aigü dans secteur capitalisitique

- **Eloignement de l'équilibre de long-terme d'un secteur** (somme des décisions d'investissement des acteurs en concurrence) **de l'optimalité** (biais dans les choix).

- Cet éloignement est accru par les spécificités de l'électricité.

1.2 Critics of the long term equilibrium paradigm in network industries

- **Coordination through price signals in the general equilibrium framework**
  - Same hypothesis of rationality
  - Prices are seen as perfectly flexible , reflecting the value of fundamentals by clearing the market
  - Sticky prices are criticized because market power
  - Problems in industries highly capital intensive (telecoms)

    in industries with technologies / different costs structures adapted to different temporal products (electricity)
  - The relation between costs and prices matters

- Three pitfalls in the perfect competition model

  1.Impact of price volatility on investment decisions

  1.Fixed cost recovery

  1.Increasing returns (rather than decreasing returns)

Solution for long term equilibrium in network industries

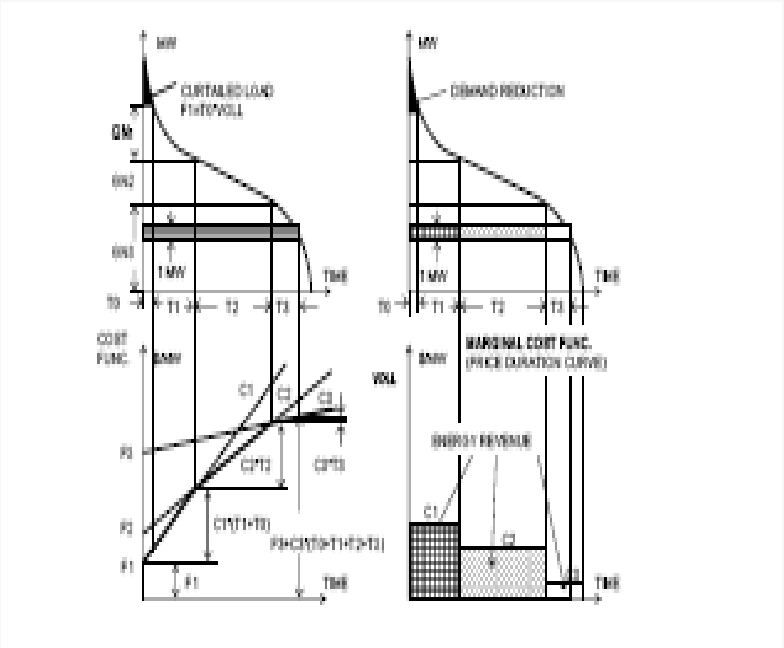
- A solution in the telecom sector (Laffont & Tirole, 2000):
  - Prices shocks when necessity and installation of infrastructures
  - Amplification effect by demand reduction
  - Proposition of smoothing by entente between operators :
  - Corollary: to admit market imperfections for long term efficiency
- In the public service regime of electricity industry
  - Resolution of equation by the marginal cost pricing of an optimized system in the monopoly regime:
  - Mimics of a perfectly competitive market with perfect imperfection and perfectly rational players
  - LRMC reference encompass problem of short term marginal cost variablity
    - Smoothing of SRM Costs + investment cost recovery
- Does market regime create the same informational signal by hourly market prices ?
  - The answer is no
  - To discover ways to make price sticky and manage investment risk

2. Market failures
and
long term inefficiency in electricity markets

Idealization of long term market efficiency

- The basic principles of such a market are as follows:
  - Energy is priced at marginal cost with demand side setting the price during scarcity hours.
  - Fixed costs of generation capacity at long run equilibrium are exactly covered by inframarginal costs and scarcity rents.
  - Forward markets and hedging instruments enable parties to manage their risk exposure.

- "As if" each technology is assigned to a load slice
- Market price : infra marginal rent during each step = the fixed costs corresponding to assigned technology



Can short term prices integrate all information about long term expectations ?

Both supply and demand price-inelastic in short term/real time in peak period

- No storage, and steep “hockey stick” shape of supply function
- No demand response to price
- Consequence : price volatility up to extreme level (5-10000 €/MWh)

The issue of price variability in electricity markets

1. Scarcity rents : market power exercise in peak load periods
   - Problem of acceptability: price cap
2. Hourly prices and long run marginal costs of different technologies
   - How average price for different intra -annual periods could indicate technology to be invested ?
   - Correspondence occurs only in optimal situation : when?

Risk aversion effects : choice of technology oriented by risk management criteria

- Not the least cost but the least technology exposed to risks

3. The peak load investment issue

From market imperfections to regulatory failures

- Three difficulties
  - ✓ Regulatory imperfection 1
    - ✓ difficulty to separate the wheat from the chaff : scarcity rents from monopolistic ones
    - ✓ price-caps because social acceptability of price spike

  → Regulatory imperfection 2

  Even without price, missing money issue
    - → because less revenues on spot and reserves markets
    - → too cautious protocols of TSO intervention

  → Risk aversion of investors
    - → (a few number of peak load periods, large price random in extreme peak)

Different capacity mechanisms

To remunerate capacity adequacy as a collective good

1. Strategic reserves contracts
   1. Long term Payment only for specific peaking units
   2. Safeguard in order to not alter spot market prices
2. Capacity payments
   1. All the capacities
   2. But no guarantee for triggering investment
3. Capacity obligation with capacity rights exchanges (US markets)
   1. Bllateral relations suppliers – generators
   2. Short term capacity rights : unfavourable design to trigger investment
4. **Forward capacity markets**
   1. **Auctioning FC contracts for reaching a reserve margin for new and existing equipments**
   2. **Long term capacity rights**

Criteria of efficiency

To centralize the mechanism for monitoring capacity additions

To insure stable revenues

4. Helping investments in generation mix by vertical arrangements

4.1. Long term contracts (LTC) associated to new equipment

Reference to fixed price and fixed quantity contracts

Difficulties of alignment of interests between producr and buyers

rigidity of such contracts

divergence on flexibility (option contracts, indexed prices, etc.) and time span

1. Producers' interest to sell by long term contracts at fixed price

- No interest to LTCs: Fixed price increases risks (all the fuel cost risk borne by the producers)
- Long term hedging strategies only related to new equipment and investment
- No interest to sell in option call

2. Large consumers' interests to LTC

Problem of squeeze with price of their products

Need of risk management when importance of energy costs

- On short term volatility :
  - outprice price does not follow in timely way
- On longer prospects: fuel price trend and carbon price

Interest for long term fixed quantity « Ribbon » purchases among other contractual pruchases

Solution:

- **1. Joint venture of one consumer with producer :** Common ownnership and operation
  - **Safeguards in the set of contracts :**
    - the common ownership,
    - the co-production of heat and power
    - The use of by-product
  - Industrial contracts at cost price

- **2. Horizontal association**:
  - **Cooperative which sell by long term PPA at cost price to its members**
  - Safeguards: common ownership

3. LTCs with suppliers

They dislike fixed quantity fixed price contract*

- Complexity of risk management of sourcing related to retail contracts:
  - Mainly retail contracts at fixed price
  - Risk of price squeeze in case of wholesale price increase
- Risk aversion to commit in LTC
  - Need of quantity flexibility
  - Interest to be hedged only for the period of high prices
- Lack of credibility of eventual long term commitment at fixed price

The solution : a base of sticky consumers to help suppliers to contract

Possiblity of risk transfer on retail prices

- USA: The historic LSEs (Joskow , 2006, Chao, Oren et Wilson, 2008)
- In Europe the core consumers in numerous markets
  - Possibility LT contracts with aggreggators of small suppliers
  - The Italian « Acquirente unicco » for the purchase of Default suppliers

4.2. Second solution : (partial)vertical integration

Vertical integration between production and supply

Theoretical benefits

- Limitation of ransaction costs ex ante / ex post
- For producers limitation of volume risk and price management
- For suppliers: physical assets an efficient way of hedging related to their sales on small consumers segment

- An obvious tendency on liberalized electricity markets

(USA, UK, New Zealand)

To come from

- 2 bis Horizontal concentration
  - Diversification of generation assets
  - Geographical diversification in several markets
  - Size and corporate finance (good rating)

4.3. Dilemna :Market imperfections vs long term efficiency

- Conventional view :
  - LTC and vertical integration: barriers to entries
  - Focus on concentration HHI…
  - A limited development of spot markets favors price volatility
  - Consequence:
    - Endogenous effect of reinforcement of verticalized model (long term contracts, integration,…)
    - Difficulties for entries

- But model with forward markets (Allaz et Villa)
  - LTC and partial vertical integration diminish incentives to market power exercise

Incentives effects by short term competition inferior to social benefit allowed by vertical arrangements

5. To conclude: Policy implications

Long term contracts or vertical integration do not make sense in the decentralized model advocated by the European Commission.

Stabilized expectations are necessary, as sticky prices, to give optimal incentives to invest.

Short term prices given by markets do not succeed to produce such signals.

The need for regulatory compromise in order to ensure long term efficiency

We must accept market imperfections as soon we recognize that competition is more a process than an equilibrium.