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Forward contracts in the Australian Electricity Market

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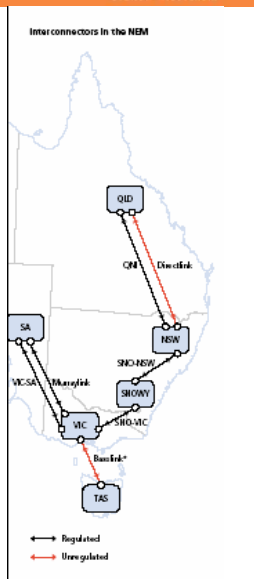
Overview

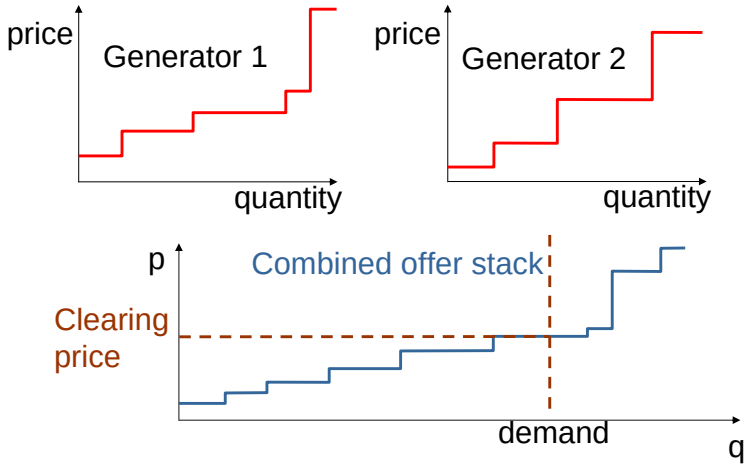
- Fundamentals: forward and spot
- Interviews with participants in the NEM:
  - A mix of different types of forward contract
  - Hedging strategies
  - Setting a contract price
  - Settlement Residue Auctions
  - Future trends

Spot market

- NEMCO runs a spot market where prices (for each 5 minutes) are determined by generator bids and demand requirements, taking account of network constraints.
- This leads to half-hour average prices at each regional node
- Prices are constrained to be less than $10,000 per MWh

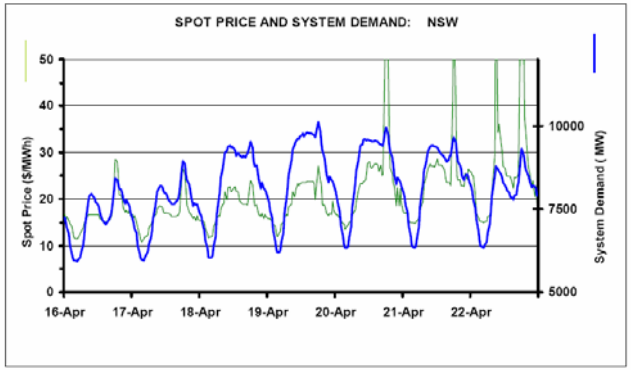


Generators are paid the clearing price



Spot prices are highly volatile

- Demand drives price, but this is not the whole story

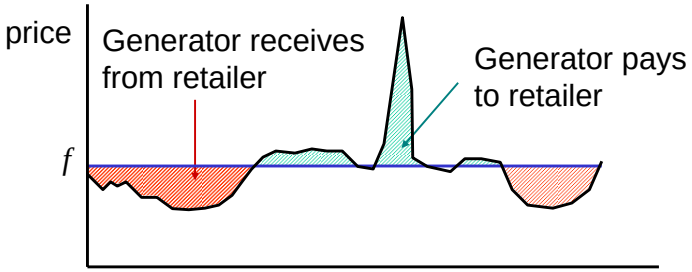


Forward (hedging) contracts - swaps

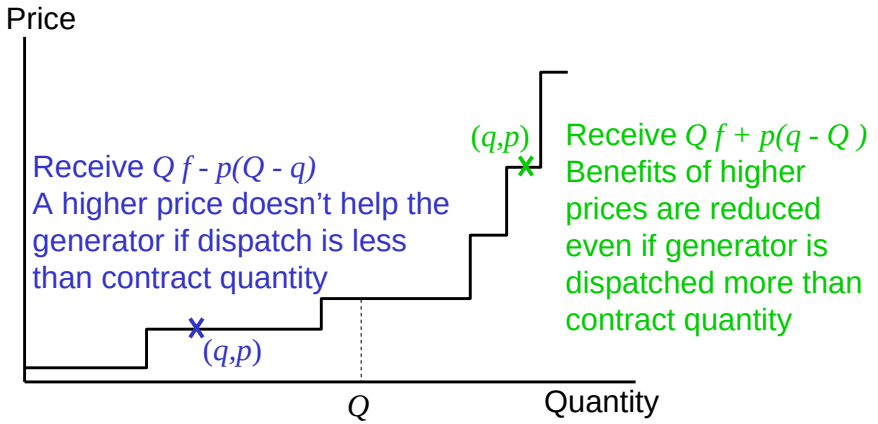
- These are purely financial instruments – all electricity continues to be traded through NEM
- Generator sells a contract to a retailer for a quantity Q at a price f
- Generator then pays an amount $Q(p - f)$ to the retailer if the spot price is p
- The retailer continues to pay price p for the power it buys in the spot market
- This is like guaranteeing a price f for a quantity Q

Contracts protect retailers from high prices

- Setting the contract price to the expected price means that expected net payments under contracts are zero



Contracts reduce generator bids



How should contracts be priced?

- Possibility of arbitrage implies forward price is expected spot price (plus a risk premium).
- But contracts lower spot prices and leave generators worse off.
- Individually generators would prefer not to sign contracts, but are persuaded to do so since not having contracts when others do is very bad. (Allaz and Vila 1993: *prisoner's dilemma*)
- An alternative theory suggests that contract prices are set higher (at the spot prices which would occur if contracts were not signed)

Interviews with NEM participants

- 26 interviews November - December 2005
- 8 interviews with retailers, 16 with generators, 1 with a market intermediary, 1 with a broker
- This covered almost all NEM participants
- Aim to understand the process used within the contract market

Three types of contract

- Bilateral OTC trades negotiated directly
  - Flexible structure of contract, often large deals
- Bilateral OTC trades on standard products through brokers
  - Contract prices agreed before counterparty is named, 6 brokers phone round chasing deals.
- Anonymous futures contracts traded on the SFE
  - Daily margin calls eliminate credit risk

Mix of contracts

- Great variation between participants
- Most contracts operate within a 3 year horizon. *"Not many people want to go out past three years, because the water is getting a bit murky out there"*
- Standard contracts are quarters or years, and peak, off peak or base (e.g Vic peak Q2 07).
- 65-70% of contract volume in the form of swaps (rest in caps and other options)
- Around 50% are Direct OTC, 40% are Broker OTC and 10% are futures (% futures is growing)

Risk attitudes

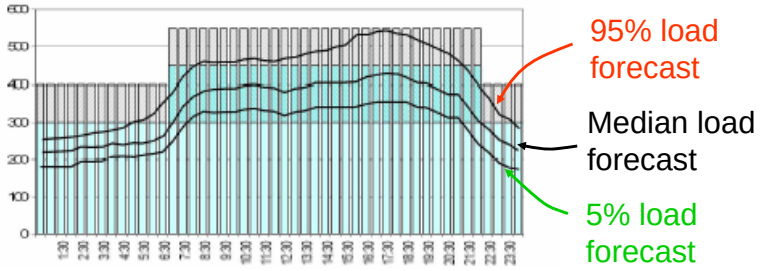
- Differences between individual participants
- Risk averse players see forward market as a way of hedging away risk
- More risk tolerant players run a more speculative trade book as well as a hedge book
- Even hedgers may run a small trade book. *"We believe that if you are active in the market then you are going to understand who is doing what and what prices are out there"*

Volume and price risk

- If a retailer has a contract for a quantity Q and also sells this amount – then spot price is irrelevant
- But there remains a volume risk.
- If retailer sells $Q-\Delta$ and spot price p is less than contract price f, then retailer loses $\Delta(f-p)$
- If retailer sells $Q+\Delta$ and spot price p is more than contract price f, then retailer loses $\Delta(p-f)$
- As p can go to $10,000 the risk from under contracting is substantial

A retailer hedging strategy

- A retailer might hold
  - Swap for 300 MW at $35 (flat)
  - Swap for 150 MW at $50 (peak)
  - $300 Cap for 100 MW (at cost of $500 per hr)



Hedging for a base load generator

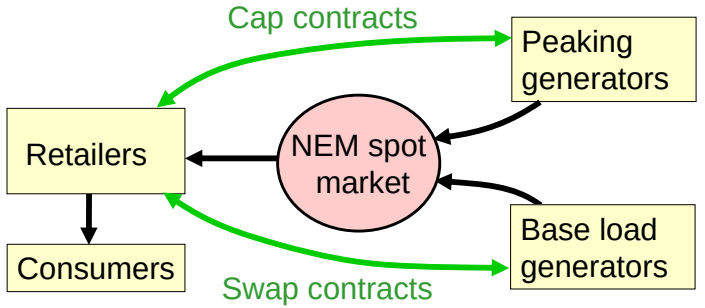
- The algebra gets reversed.
- The risk of losses is now from a generator being contracted more than it is dispatched at a time when there is a price spike
- This is exactly the situation that will occur with an unplanned outage that triggers a price spike
- So if a generator can run n units it is likely to limit the contract quantity to the amount that can be supplied by $n-1$ units

Hedging for a peaking generator

- Without forward contracts a peaking generator only makes money when spot prices become high enough.
- By signing cap contracts with retailers the peaking generator makes money even when spot price is low.

Balance of demand for different contracts

- Requirement for cap contracts is driven by volatility in demand



Special forms of contract

- Shaped or profiled swap contracts
- Contract linked to overall system load at the node in question or with a trigger
- Swap with optionality – retailer can nominate quantity
- Contracts signed between generators to take over capacity unavailable during an outage
- Contracts with *force majeure* clauses

How are prices determined?

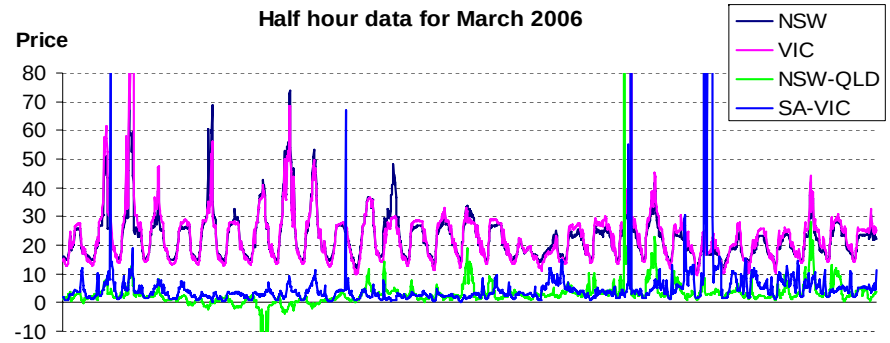
- Fundamentally a supply-demand balance, e.g. a comment: *"Generators in NSW are getting to the envelope of where they really want to sell at"*
- Some strategic decisions by participants on issues like contract cover, building of portfolios, etc. are based on view of the forward curve
- Risk limits can force participants to sign contracts at unattractive prices
- Price discovery for Direct OTC can take place through Futures and Broker OTC markets

The gap between spot and forward prices

- There has been a price premium in the forward market
- Average $9.09 per MWh for 4 regions and 3 years 2003-2005 for peak period contracts
- But NSW shows no evidence of a premium. NSW may be different as a result of the state-based Electricity Tariff Equalisation Fund implying lower contract cover for NSW generators
- Difficult to disentangle the risk premium component from the premium that arises from contracts depressing spot prices.

Price differences between regions

- When there is congestion prices can separate



Settlement Residue Auction

- SRA is an instrument participants can use to reduce risk associated with location (“basis risk”)
- Price separation means a large settlement residue – bidding for an allocation of this essentially buys some basis risk
- Can be combined with hedges between regions
- But SRAs are not very flexible and they are also not ‘firm’ (sometimes there can be price separation without much settlement residue)
- Seems that hedgers generally avoid SRAs

Trends in the market

- Move towards participants being able to manage risk themselves, rather than passing it on to third parties
- Market seems to operate reasonably well – but there are fears about the effect of increasing vertical integration
- Liquidity issues create problems for short term contracting, and unusual contract forms

Summary

- Forward markets are essential for the proper functioning of a wholesale electricity market
- Actual profits depend on contract positions – but there is little transparency in OTC market
- These markets are poorly modeled by academics
- Complex strategies are needed for good hedging of volume and price risk
- There is a balance of supply and demand for different types of contract

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Questions??