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FORWARD CURVES and FORECASTS

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The Holy Grail of the market analyst:

- "*Predict spot prices*"

- Available options are:
  - Forward price curves (market)
  - Forecast prices (models)

Proposition:

Neither option consistently provides acceptable spot price predictability

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First some definitions:

- Forward price curves are prices which are set today for future delivery
- Spot prices are prices at delivery
- Forecast prices or Expected spot are prices which are calculated using a simulation model usually driven by market fundamentals

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Why do we want good predictors of spot prices?

- Some reasons:
  - Reliable valuations
  - Improves plant management
  - Create trading opportunities

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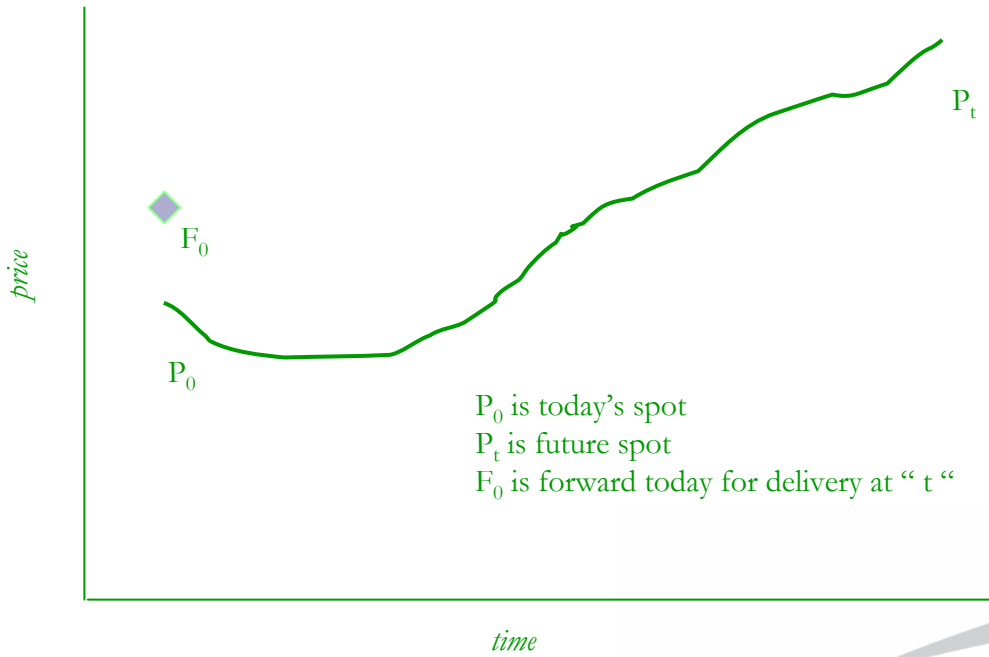
What is the theoretical perspective?

Analysis:

The relationship between spot prices (P) and forward prices (F) is dictated by the degree of perceived risk associated with the market.



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What is the theoretical perspective?

Analysis:

$$P_0 = \frac{F_0}{[1 + r_f]^n}$$

$$P_0 = \frac{P_t}{[1 + k]^n}$$

$$F_0 = P_t * \left\{ \frac{1 + r_f}{1 + k} \right\}^n$$

Where:
k = discount rate
n = # of periods between "0" and "t"
r_f = Risk free rate of return

If $k > r_f$ then $F_0 < P_t$

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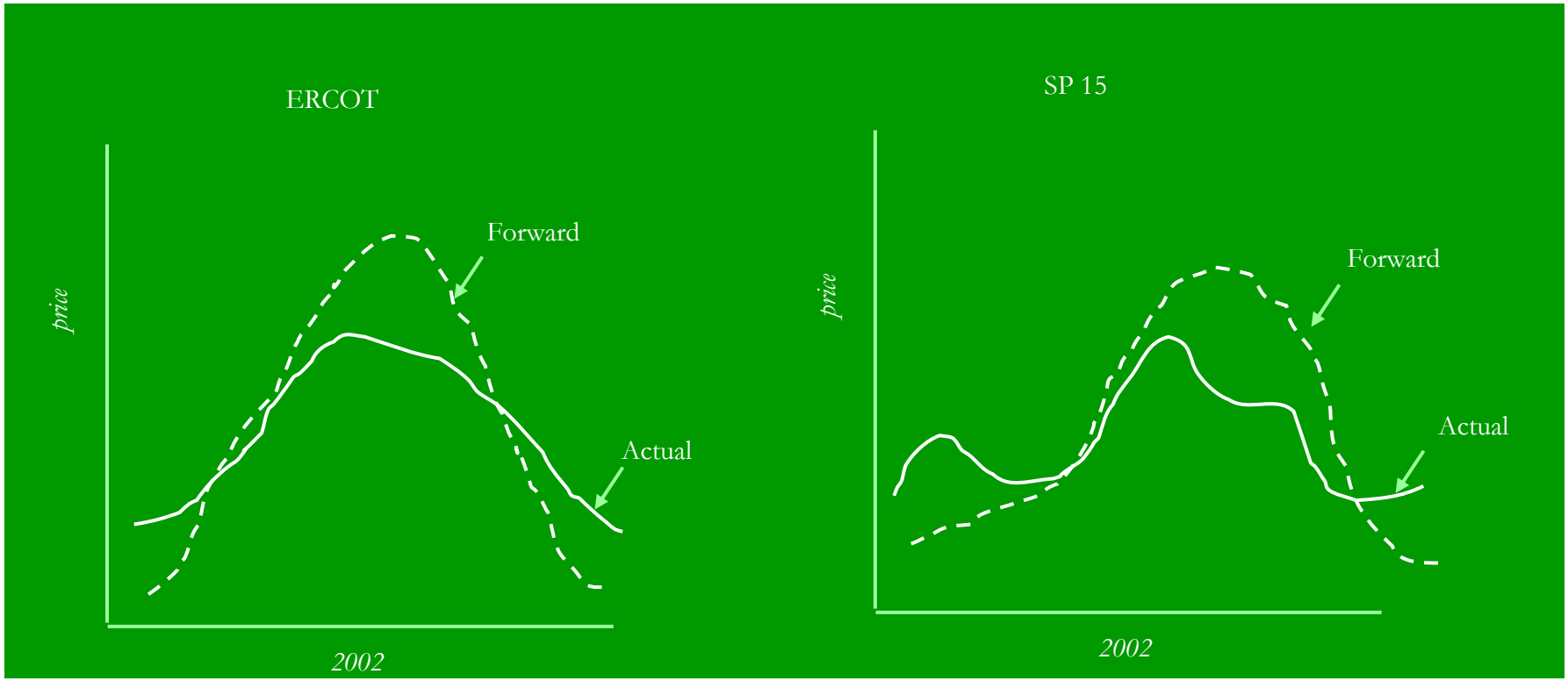
What is the empirical perspective?

Analysis:



Finding: In the shoulder months the empirical data support the theory. However, the reverse is true in the peak load months. Why ? Suppliers "animal" spirits and Consumers' aversion to risk bid up the forwards.

Conclusion: Forwards are not good predictors of spot. However, they behave in reasonably explainable fashion.

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Forecast of spot prices

- The other option to predict spot prices are forecast models which are generally fundamentals driven
- They rely on significant volume of input data and utilize tools and algorithms that attempt to approximate real world market operations
- Generally, their solution logic is designed to satisfy a multiple constraint (economic and operational) objective of meeting the energy demand.

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Forecast of spot prices

Analysis:

Direction of backcast vs real-time data (*)

	$/mwh
WKD On	lower
WKD Off	higher
WE On	lower
WE Off	higher

(*) based on daily strips of PJM data May-Aug 2002

Fundamental model showed consistent understatement of on-peak and overstatement of off-peak prices. Why?

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Biases in simulation models

- Factors contributing to a downward bias on-peak
  - Emphasis on single point vs stochastic simulations
  - Failure to fully capture bidding strategies by generators
  - Lack of ancillary service modeling
  - Lack of full simulation of operating constraints
  - The assumption of perfect market efficiency
  - Other?

- Factors contributing to an upward bias off-peak
  - Failure to fully capture bidding strategies by generators
  - Other?

Conclusion: Generally, fundamental models are not good predictors of spot prices. Out of the box production models have built in biases and limitations that only approximate market operations

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Key Points

- Our ability to accurately predict spot prices is not good.
- On the one hand forwards prove to be a poor predictor because the relationship of the forwards to the spot price is biased and is dictated by the largely illiquid current nature of the electricity markets.
- On the other hand, fundamental models miss out on the operating complexities of real-time markets and as such can not accurately predict spot prices.
- A market analyst must be cognizant of these factors as they attempt to use either: the market data or the forecast data.

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Recommendation

- **Until spot markets become more liquid and popular the simulation model, when used with appropriate adjustments to account for its biases, represents the best alternative for producing reliable results.**

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