

# Behavioural Responses to Market Events

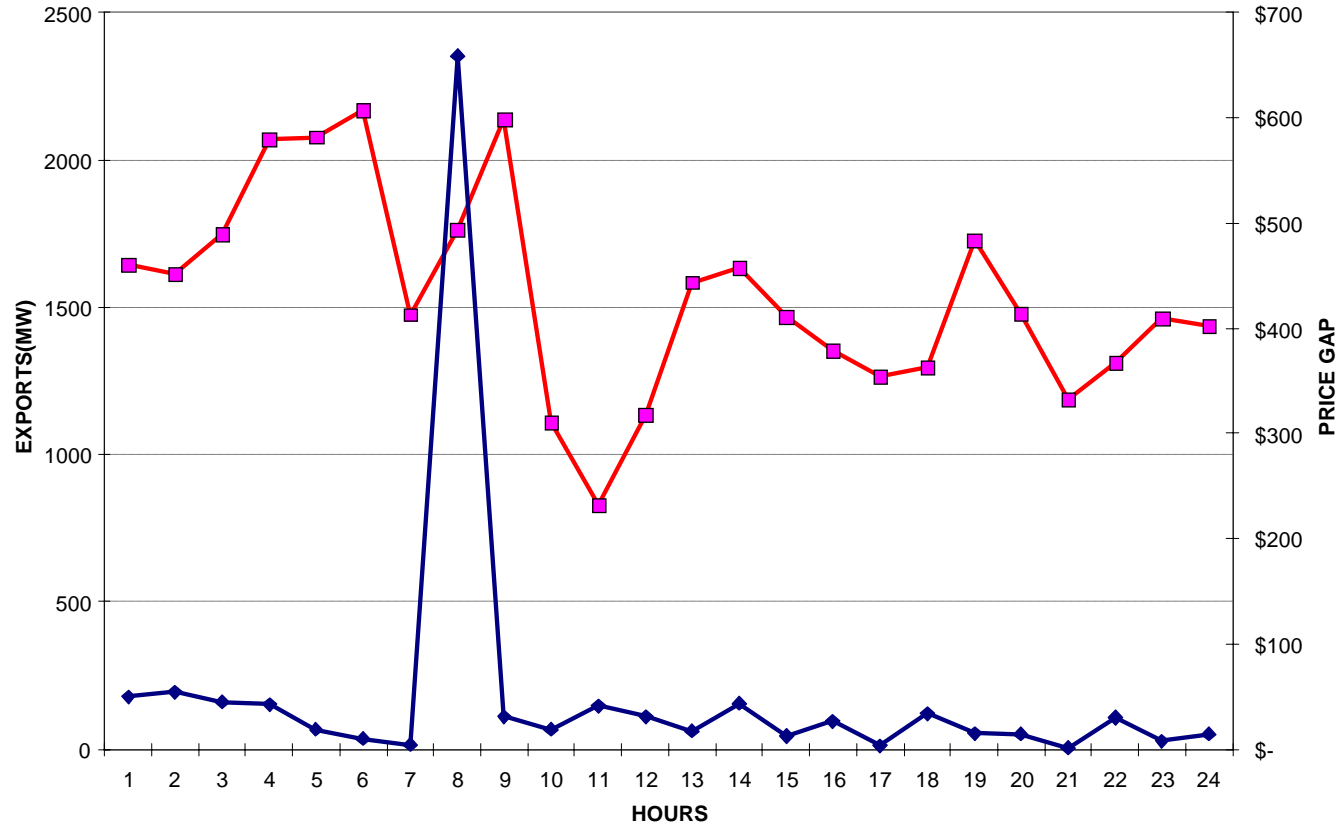
Market Pricing Working Group

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**Price Difference and Exports**  
April 21, 2006



## Objectives

- Follow up on August 2006 Presentation
- Types of Behavioral Responses
- Event Analysis
- Export Demand Analysis
- Moving Forward

- Behavioural responses to expected price increases.
  1. Arbitrage between markets (imports, exports).
  2. Price-responsive loads; Load-shifting from high to low price hours, embedded generation.

A thorough analysis of market rules and market design changes requires analysis of behavioural responses to these changes.

- This presentation focuses on export arbitrage.
- Two key questions:
  1. Do exports from Ontario respond to changes in the HOEP? (Event analysis)
  2. If so, can we quantify that response? (Econometric analysis)

- *“Half of this game is 90 per cent mental”*
  - *Danny Ozark, Phillies baseball team manager*
- *You guys pair up in groups of three, then line up in a circle”*
  - *Bill Peterson, Florida State Coach*
- *The similarities between me and my father are different*
  - *Dale Berra (son of Yogi Berra)*

- Widely used in financial industry e.g. impact of merger announcement on share prices.
- Key elements
  1. Define the event;
    - Forced nuclear outages - 37 random events.
    - Loss of base load supply has a sizeable impact on HOEP.
  2. Examine trends in HOEP, Export Volume , New York price post the event relative to an average of pre-event values.

- Compares 'metric' before and after the event.
- Metric used is deviation from mean value.
- Example:

Before Event

Column 1	Column 2	Column 3
HOEP	Mean of pre-event HOEP	Deviation from mean of pre-event HOEP
35	30.6	4.4
33	30.6	2.4
25	30.6	-5.6
29	30.6	-1.6
31	30.6	0.4

After Event

Column A	Column B	Column C
HOEP	Mean of pre-event HOEP	Deviation from mean of pre-event HOEP
60	30.6	29.4
80	30.6	49.4
65	30.6	34.4
51	30.6	20.4
40	30.6	9.4

Chart A: Pre-Event HOEP Trend

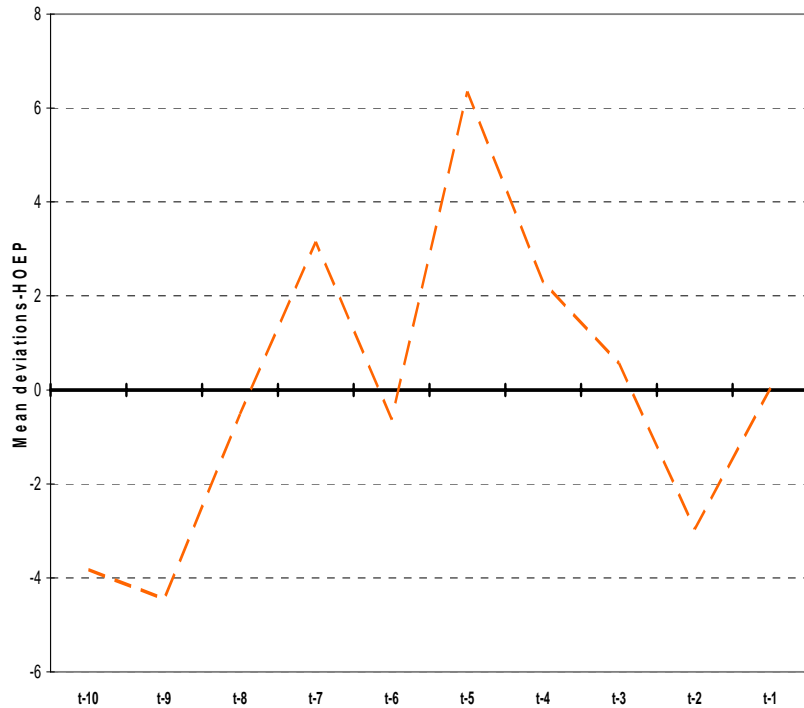


Chart 1: Post-event Trend in HOEP

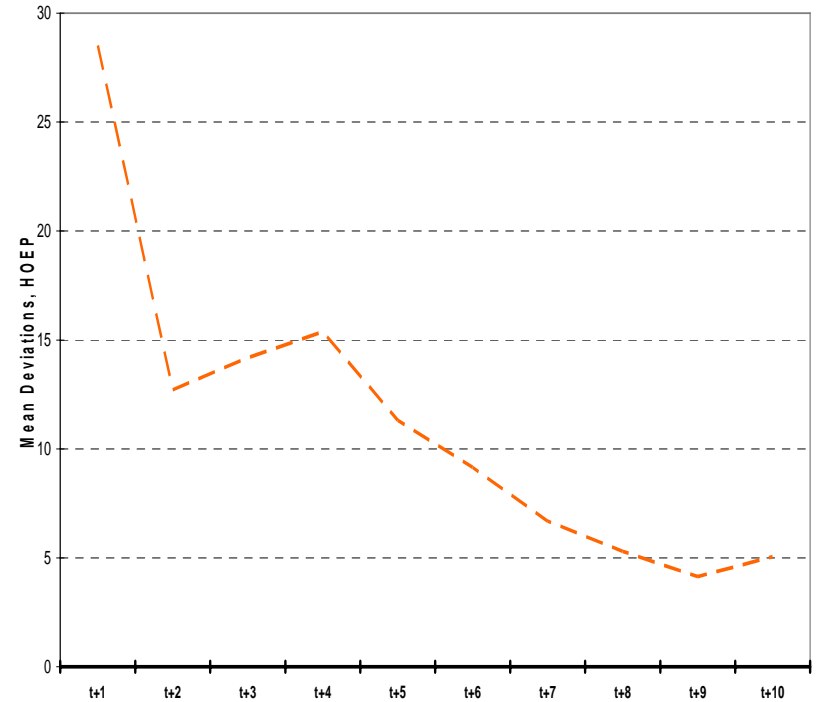


Chart C: Pre-Event Export Volume Trend

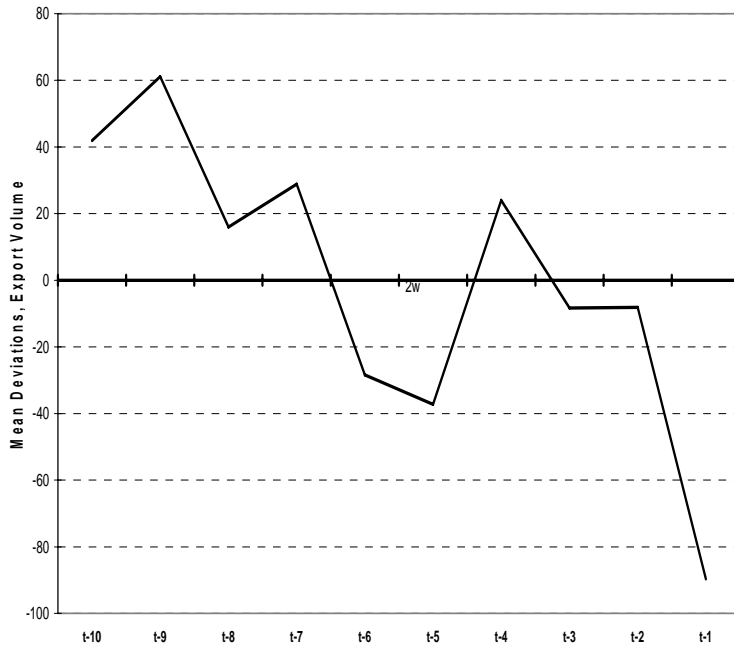


Chart 3: Post-event Trend in Export Volume



Chart A:Pre-Event New York price

Chart A:Post-Event New York price

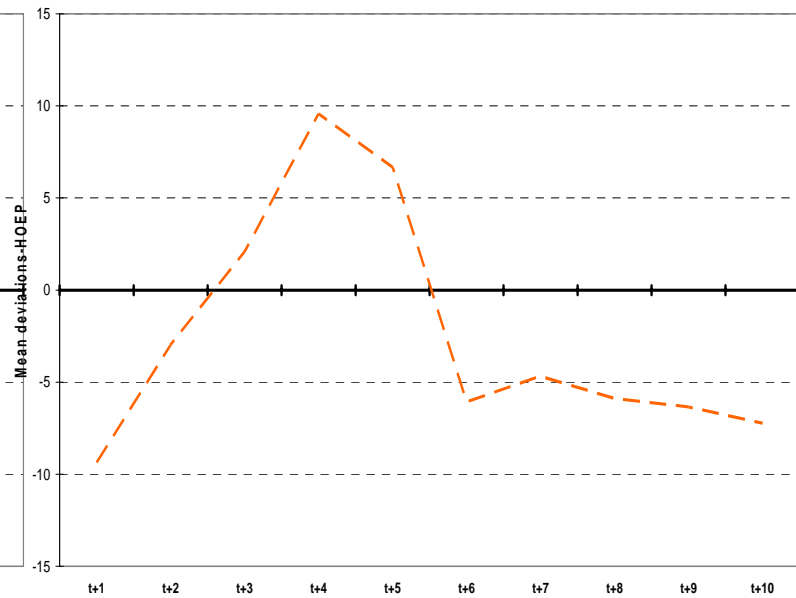
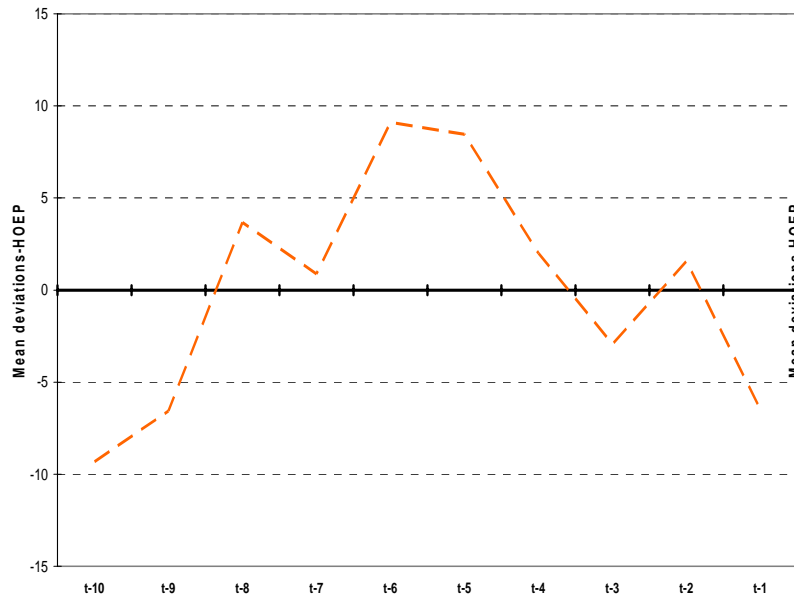
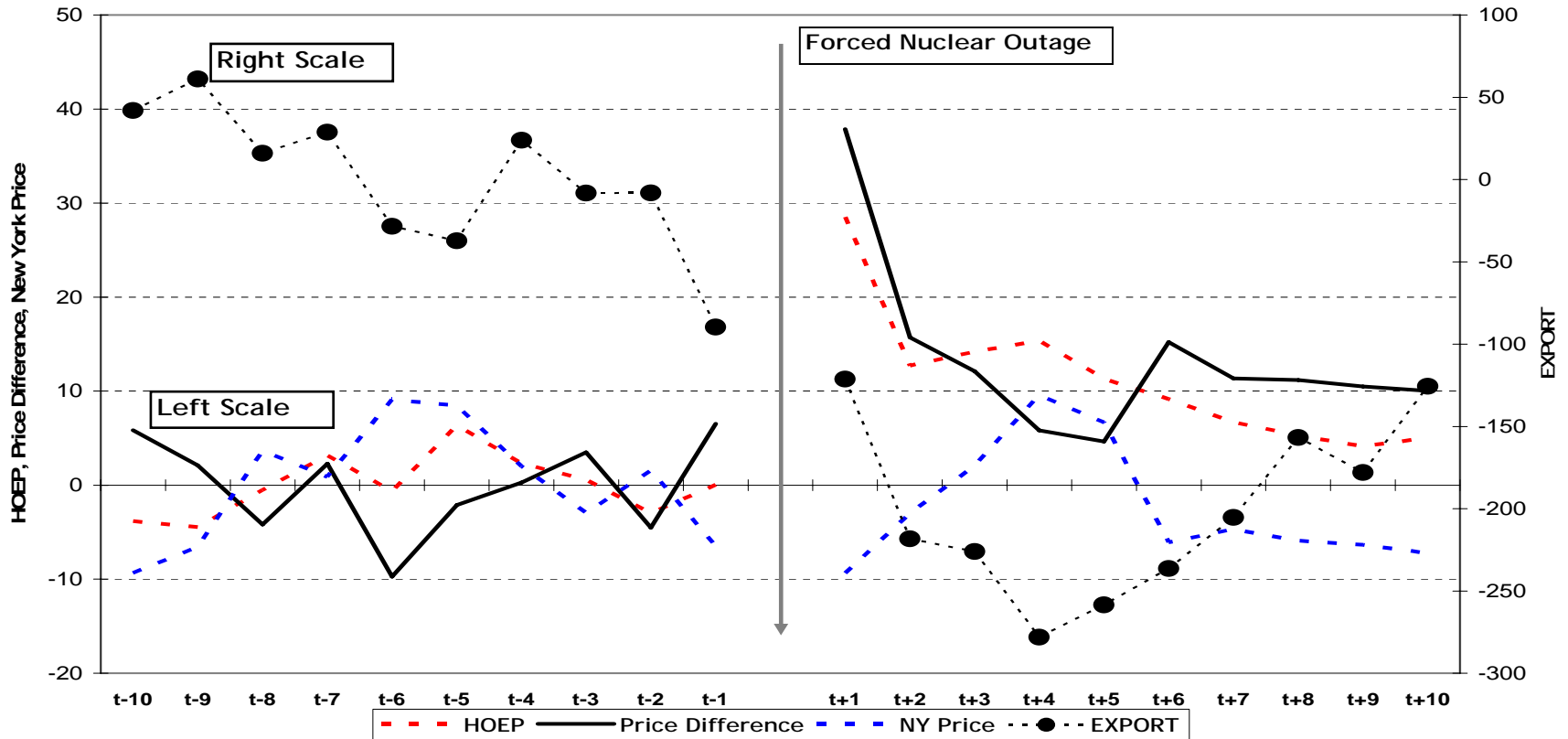


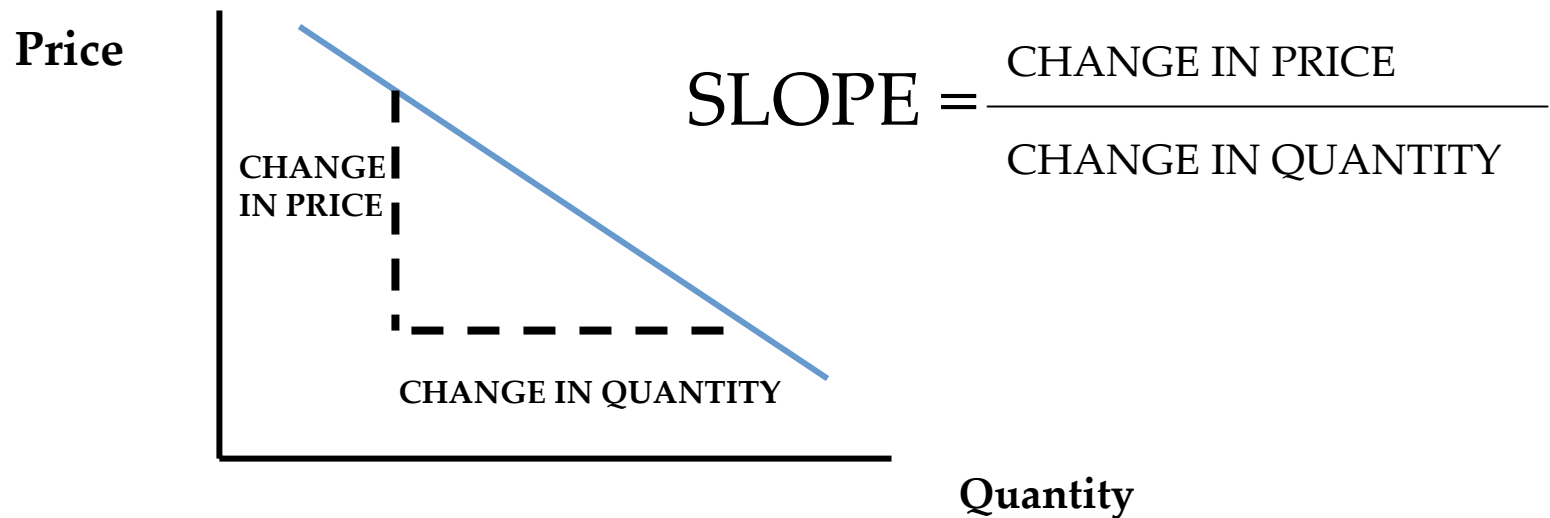
Chart 1: Pre-and Post -Event Trends



- Export volume drops significantly following an increase in the HOEP.
- HOEP initially increases relative to the New York price.
- Large Ontario-New York price gap is transient because arbitrage pressures quickly erode profit opportunities.

- The quantification of export response requires estimation of an export demand curve.
- A demand curve is simply a schedule of quantities at different price levels, other things equal.
- The slope of the demand curve provides information on the sensitivity of quantity changes to changes in the price.

## A Demand Curve



- The slope of the demand curve and the elasticity measure are related:
- Elasticity tells us how much a given percentage change in the price translates into a percentage change in quantity.
- Elasticity = slope\*  $\frac{\text{mean quantity}}{\text{mean price}}$

- The challenge is to find a good way to estimate the slope of the demand curve.
- Econometric analysis provides a robust approach.

- Econometric analysis uses economic theory to develop a relationship between export volume and prices (Ontario and New York).
- The model expresses export volume as a function of HOEP and the New York price, monthly fixed effects and a time trend. Used monthly data from January 2003 to October 2006.
- Econometric techniques are then used to calculate an optimal estimate of the slope from which the elasticity is derived.

- The analysis indicates a price elasticity of export of negative 4.7.
- This means a 1 per cent increase in the HOEP leads to approximately 5 per cent decrease in export volume.
- 19 times out of 20 the elasticity estimate falls between negative 2.9 and negative 6.3.

- Event analysis shows export volume responds to price changes.
- Econometric analysis shows export volume is highly sensitive to price changes.

- Export response is a subset of overall market responses to price changes. Other responses:
  - Price responsive loads i.e. embedded generation.
  - Price elasticity of industrial segments e.g. pulp and paper, metal ore mining, iron and steel, petroleum products.
- Consider impact of risk preferences on the demand curve.
- Incorporate import response into a regional model.
- Study Integration of Regional Markets.