Before-and-after analysis:
An application of structural break testing to the determination of economic damages.

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Motivation

- Before-and-after method is highly reliable and widely accepted, BUT it is not fool proof
- Tomlin and Merrell (2006) demonstrate, “simple” forms of the before-and-after method may yield “phantom” damages
- The simplistic approach, however, may run into three problems that we label:
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- Nevada Bob’s expert estimated lost profit by simply calculating profit per square foot at the alternative location
- The court concluded,
  - “The expert assumed that the only difference between the two locations was the square footage”
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- Include all major observable factors in the model
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- Then selecting the supremum of the individual Wald statistics (sup-Wald test statistic)
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In this case, Clear Channel Communications, Inc. et al. was alleged to have “engaged in anticompetitive...practices in an effort to...extend its monopoly power in the market for live rock concerts tickets

- The plaintiff’s expert predict the expected average ticket prices from 2000 through 2006 using ticket prices from
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The court concluded:

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- “…only one ‘event’ (i.e., the entry of Defendants into the market in 2000) was considered”
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In rebuttal the plaintiff’s expert

- Conducted a structural break test at the year 2000
- Pooled sample of concerts in both Los Angeles and Denver
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- “Moreover, the ‘pooled sample’ analysis fails even to consider whether a so-called ‘structural break’ occurred in any year other than 2000....”

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Solution to the latent omitted variable problem

- To account for an unobserved factor, we must allow for multiple unknown breakpoints.
- Bai (1997) and Bai and Perron (1998) further extend the Quandt-Andrews test to allow for multiple unknown breakpoints.
- Perron (2006) recommends:
  - Double maximum test to determine if any breaks are present.
  - Sequential test starting at some value greater than zero to determine the number of breakpoints.
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Dairy Litigation

In this case, the dairy claimed their business was harmed by stray voltage, and sued electrical utility. The court found in favor the dairy ordered repairs and awarded damages.

- A partial remedy was implemented July 2009
- The definitive remedy was implemented June 2012
Modeling the Damage Period

- **Dependent Variable**
  MHA Annualized average monthly production per cow

- **Breaking Regressors**
  - Constant
  - Trend Deterministic time trend

- **Non-breaking Regressors**
  - L1 Percent of heard that has had only on calf
Percent of herd in 1st, 2nd or 3rd+ lactation

![Graph showing the percentage of the herd in 1st, 2nd, and 3+ lactations from 2008 to 2014. The graph indicates a decrease in the percentage of cows in 1st lactation and an increase in cows in 3+ lactations.](image-url)
3. Empirical example

Modeling the Damage Period

- Preform the double maximum structural break testing procedure as suggested by Perron (2006) with
  - trimming is set to 20%
  - maximum number of breaks set to 3
  - WDMax test statistic = 24.344 (C.V. = 12.15)

- Number of Breaks
  - Significant F-statistic largest breaks: 3
  - UDmax = 19.97 (C.V. = 11.16) determined breaks: 2
  - WDmax = 24.344 (C.V. = 12.15) determined breaks: 2

- Estimated break dates:
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Trend with Breaks

- Monthly Herd Average
- Trend with Breaks
4. Objections

Three objections to structural break analysis

1. Post hoc ergo propter hoc fallacy
2. Nearly simultaneous causal events
3. Causal lag
Post hoc ergo propter hoc

- Objection
  - Structural break analysis relies on timing evidence
  - This line of reasoning may well suffer either the post hoc ergo propter hoc or the cum hoc ergo propter hoc fallacies.

- Answer
  - All before-and-after analysis relies on timing evidence (see e.g. Young v. Hickory Business Furniture 2000).
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- Objection
  - An issue is whether more than one causal factor could have occurred within the same time period
  - This challenge is most apparent when working with annual data

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- However, as Gaughan states,
  
  “[E]ven in the liability phase [of a trial], there can also be important economic and financial issues for which the expert [economist] may provide evidence” Gaughan (2009, 54)

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