Measuring the Economic Impact of Food Safety Recalls on Food Processing Firms: An Event Study Analysis of the 2008 Listeriosis Recall in Canada

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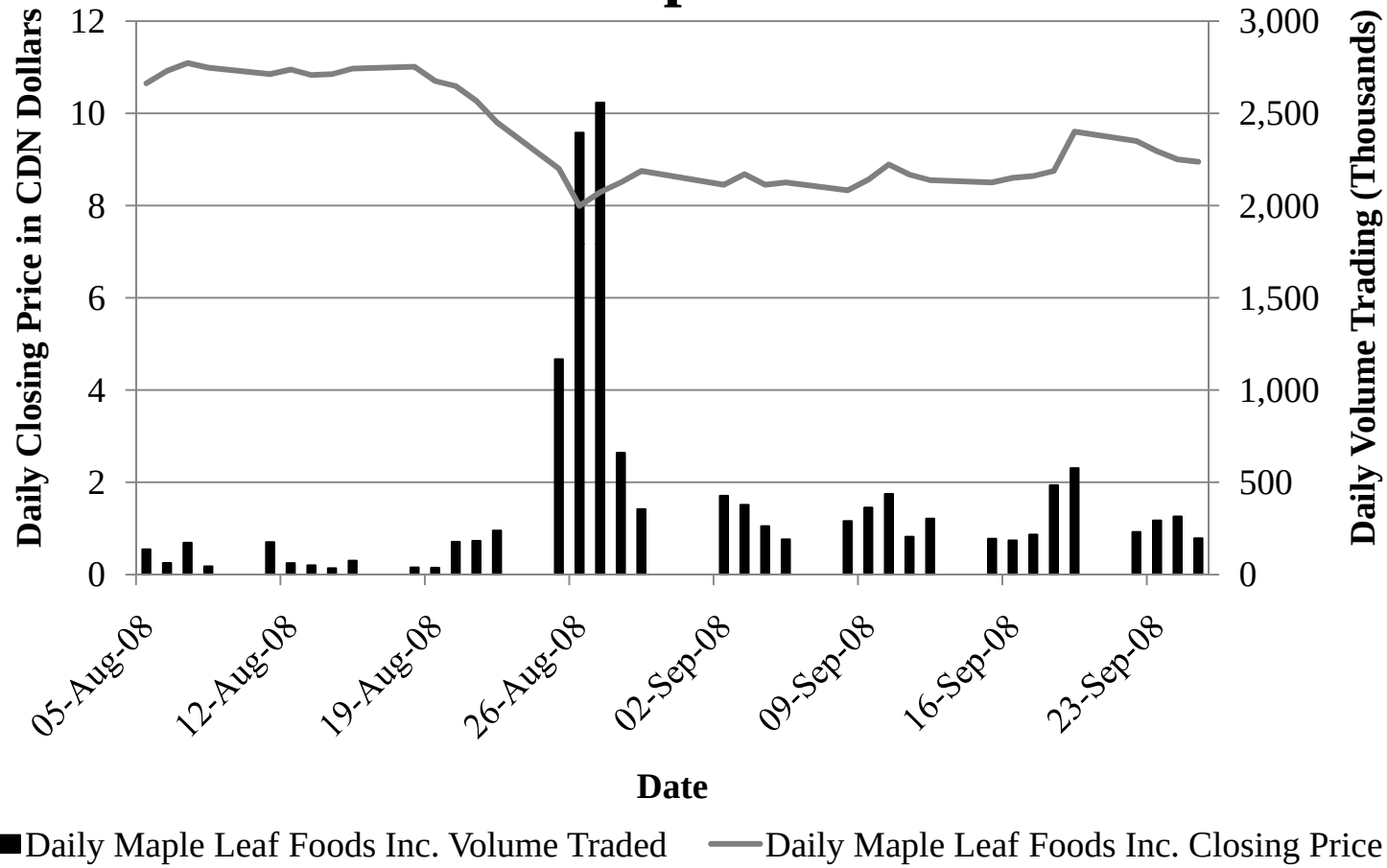
Background

- 17 August 2008 CFIA issues health alert for *Listeriosis Monocytogenes*
- 22 August 2008 first Listeria related death announced
- 23 August 2008 Maple Leaf initiates public communications
  - 57 cases of Illnesses resulting in 22 deaths across Canada

Daily Closing Prices and Volume Trading for Maple Leaf Foods Inc. for the Period 5 August 2008 to 25 September 2008



Research Questions

- What was the impact of the 2008 Listeria recall on the return to Maple Leaf's stocks?
- What was the impact of the 2008 Listeria recall on Premium Brands Holdings?(A spillover effect)
- Can we say anything about the effectiveness of Maple Leaf's response?

Broader Literature Contributions

- Bovine Spongiform Encephalopathy (BSE) in the U.K. (Henson and Mazzocchi, 2002)
- *E. Coli* O157:H7 in the U.S. (McKenzie and Thomsen, 2001)
- Various food borne pathogens in the U.S. (Salin and Hooker, 2001)
  - Examine how firm's stock price responds to negative food safety announcements over time
  - Use event study methods to assess the size of abnormal returns

Empirical Framework

- Event study approach
- Measure abnormal return after an unexpected shock (e.g. recall, lawsuit, etc)
- Abnormal return equals actual return minus expected return had the event not occurred:

  $AR_{it}=R_{it}-E[R_{it}|X_t]$

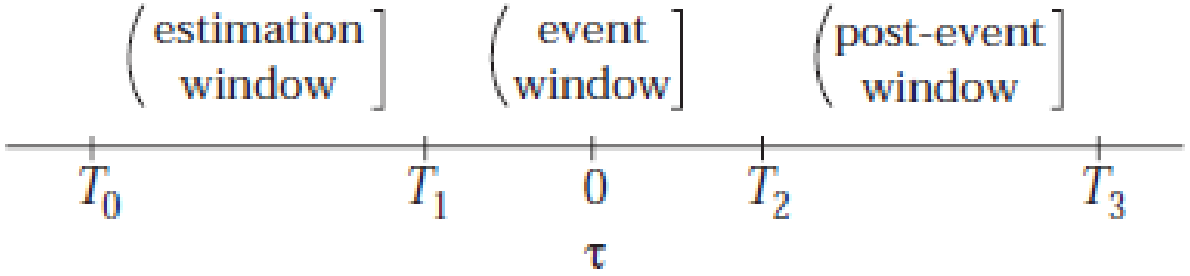
  - Rit is the actual return
  - $E[R_{it}|X_t]$ is the expected return had the event not occurred (conditioned on available information, X_t)
- Need a way to measure $E[R_{it}|X_t]$

Empirical Framework, cont

- Measure expected return using the market model (replace X_t with return to a market index (R_{mt})):

  $AR_{it}=R_{it}-E[R_{it}|R_{mt}]$

  - Estimate market model using pre-event data (estimation window)
  - Use estimated model and actual value of R_{mt} to predict $E[R_{it}|R_{mt}]$ during the event window
  - Calculate abnormal return
  - Undertake calculations during event and post-event windows



Methods and Data

- Market model

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$$

  - Daily stock prices from DataStream
    - MFI – Maple Leaf Foods Inc.
    - PBH – Premium Brands Holdings
    - S&P/TSX Smallcap Index
    - S&P/TSX Composite Index
- Internet news releases
  - Google, Google Finance, Yahoo! Canada Finance, TSX news feeds and the Canadian Securities Commission

Market Model Regression of MFI and PBH on the S&P/TSX Smallcap &Composite Indices from 3 Dec 2007 - 14 Aug 2008

	S&P/TSX Smallcap Index	S&P/TSX Composite Index		
	Est. Coeff	Est. Coeff	R^2	F-Stat
MFI	0.538***	n/a	0.093	18.737***
MFI	n/a	0.481***	0.079	15.504***
PBH	0.273***	n/a	0.044	8.360***
PBH	n/a	0.182**	0.021	3.815*

***Statistically significant at one percent
**Statistically significant at five percent
*Statistically significant at ten percent

Event Window Returns Analysis					
		AR's to MFI		AR's to PBH	
Date	Day	Smallcap	Composite	Smallcap	Composite
Aug-15	+1	0.018	0.021	0.003	0.004
Aug-18	0	0.006	0.004	-0.011	-0.012
Aug-19	-1	-0.026	-0.025	-0.015	-0.015
Aug-20	-2	-0.018	-0.02	0.006	0.006
Aug-21	-3	-0.038	-0.036	0.026	0.028
Aug-22	-4	-0.04	-0.042	0.003	0.002
Aug-25	-5	-0.098	-0.096	0.003	0.003
Aug-26	-6	-0.094	-0.092	-0.033	-0.032
Aug-27	-7	0.032	0.03	0.009	0.009
Aug-28	-8	0.017	0.018	-0.002	0
Aug-29	-9	0.024	0.029	-0.019	-0.016
CAR		-0.217	-0.208	-0.030	-0.024
SCAR		-10.886***	-10.385***	-1.983**	-1.555*

*** indicates 1 percent left-tail level of significance
** indicates 5 percent left-tail level of significance
* indicates 10 percent left-tail level of significance

Post-Event Window Returns Analysis
2 September 2008 – 30 September 2008

	AR's to MFI		AR's to PBH	
	Smallcap	Composite	Smallcap	Composite
CAR	0.112	0.073	-0.078	-0.107
SCAR	5.636***	3.650***	-5.150***	-6.976***

*** indicates 1 percent one-tail level of significance

Conclusions

- The 2008 Listeria announcement had a significant effect on returns over the event window
  - MFI stat. significant negative abnormal returns
  - PBH stat. significant negative abnormal returns
- Post-event window
  - MFI stat. significant positive abnormal returns
  - PBH stat. significant negative abnormal returns

Conclusions Con’t

- Public communications may have caused positive abnormal returns to MFI shares during the post-event window
- Mean closing prices of MFI shares do not regain pre-event mean closing price level during the post-event window
- Premium Brands Holdings does not announce changes to food processing procedures.

THANK YOU

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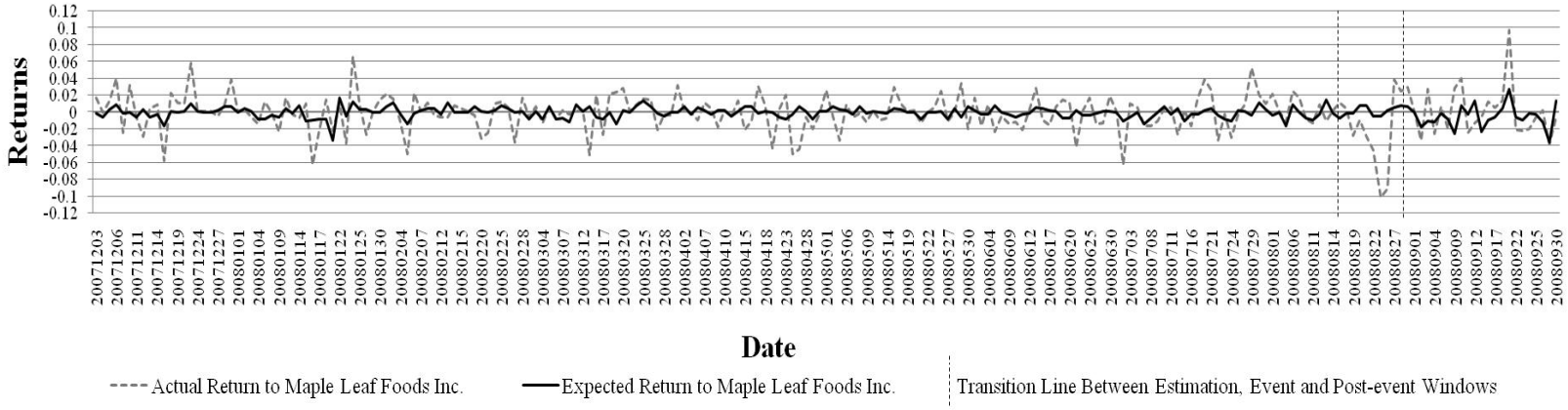
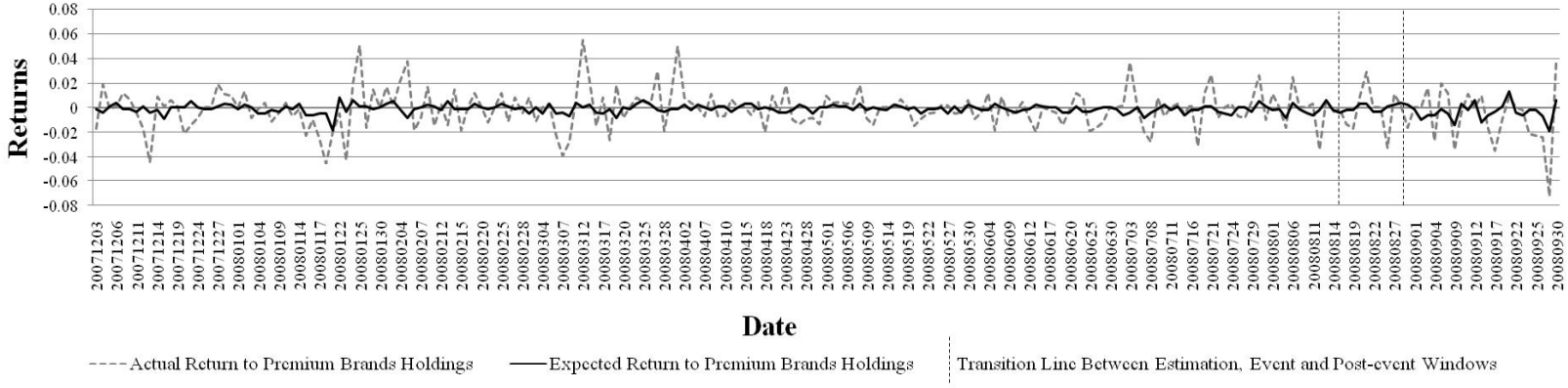
IMPROVING LIFE

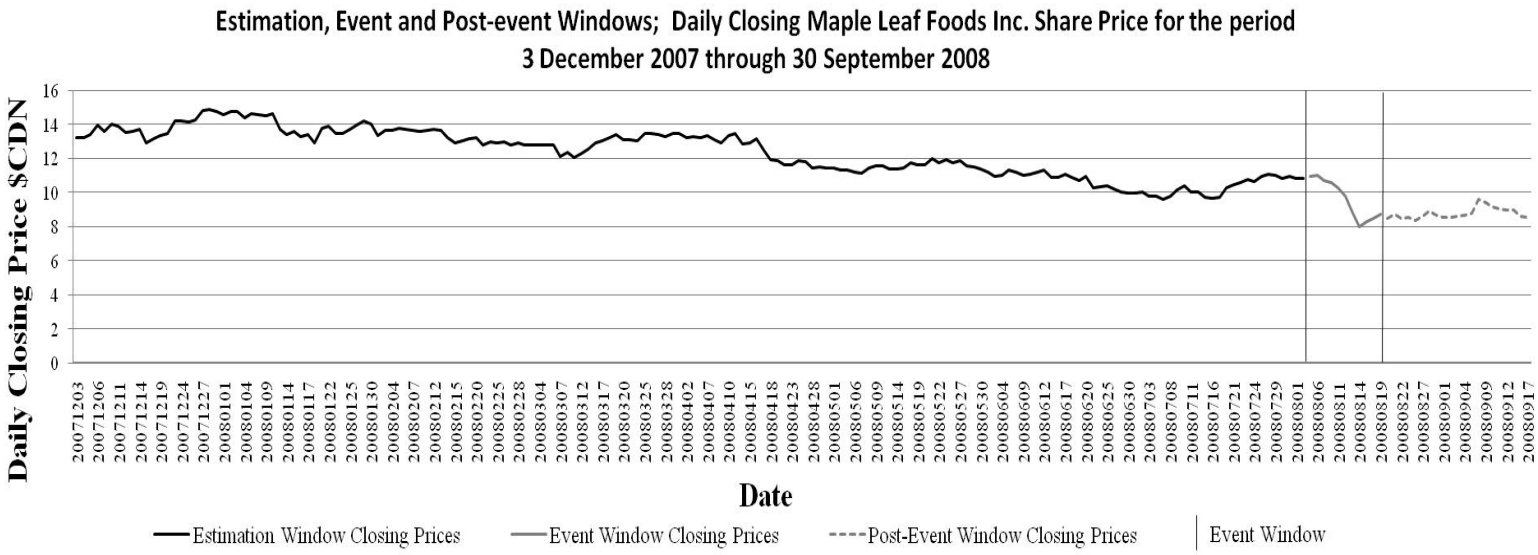
Happy to answer any questions

Estimation, Event and Post-event Windows; Actual and Expected Returns to Maple Leaf Foods Inc. using the S&P/TSX Smallcap Index from 3 December 2007 to 30 September 2009



Estimation, Event and Post-event Windows; Actual and Expected Returns to Premium Brands Holdings using the S&P/TSX Smallcap Index from 3 December 2007 to 30 September 2009




Estimation, Event and Post-event Windows; Daily Closing Maple Leaf Foods Inc. Share Price for the period
3 December 2007 through 30 September 2008
Daily Closing Price $CDN
16
14
12
10
8
6
4
2
0
20071203
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20071219
20071224
20071227
20080101
20080104
20080109
20080114
20080117
20080122
20080125
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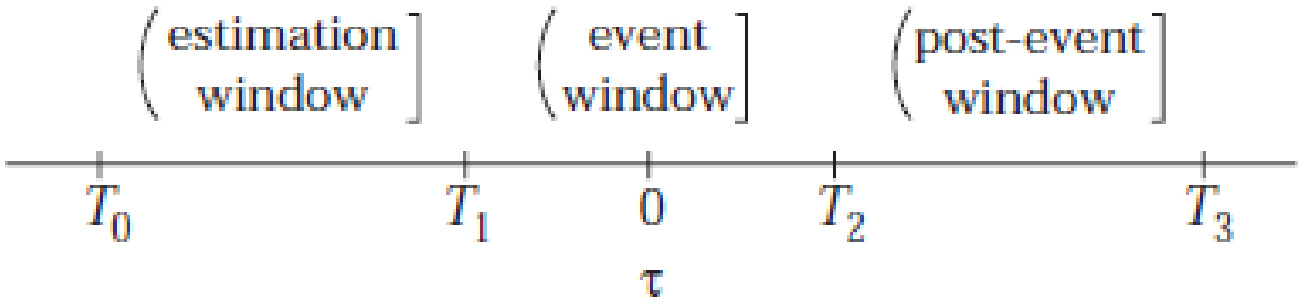
20080909
20080912
20080917
Date
Estimation Window Closing Prices
Event Window Closing Prices
Post-Event Window Closing Prices
Event Window

Event and Estimation Windows



(Campbell et. al., 1997)

Market Model Regression Diagnostics for Maple Leaf Foods Inc. and Premium Brands Holdings on the S&P/TSX Smallcap and Composite Indices for the Estimation Window 3 December 2007 - 14 August 2008

	MFI onS&P/TSX Smallcap	MFI on S&P/TSX Composite	PBH on S&P/TSX Smallcap	PBH on S&P/TSX Composite
Skewness	-0.295	-0.258	0.503	0.371
Kurtosis	0.734	0.689	2.305	2.318
Jarque-Bera	6.193	5.125	45.089	42.039
D-W d-Stat	1.94	2.2	1.98	1.94
White's Test	1.089	0.830	2.180	0.398

Abnormal Returns

$$\varepsilon_{it}^{*} = R_{it} - E[R_{it} \mid X_t]$$

Investor Maximization Problem

$$\max \xi u(c_t) + E[\beta u(c_{t+1})] s.t.$$

$$c_t = W_t - p_t \xi$$

$$c_{t+1} = W_{t+1} + x_{t+1} \xi$$

Basic Asset Pricing Equation

$$U(c_t, c_{t+1}) = u(W_t - p_t\xi) + E_t[\beta u(W_{t+1} + x_{t+1}\xi)]$$

$$- p_t u'(c_t) + E_t[\beta u'(c_{t+1})x_{t+1}] = 0$$

$$p_t u'(c_t) = E_t[\beta u'(c_{t+1})x_{t+1}]$$

$$p_t = E_t\left[\beta \frac{u'(c_{t+1})}{u'(c_t)} x_{t+1}\right]$$

Market Model Proof

$$\varepsilon_{it} = R_{it} - E\left[R_{it} \middle| X_t\right]$$

$$E\left[R_{it} \middle| X_t\right] \cong \left(\alpha_i + \beta R_{mt}\right)$$

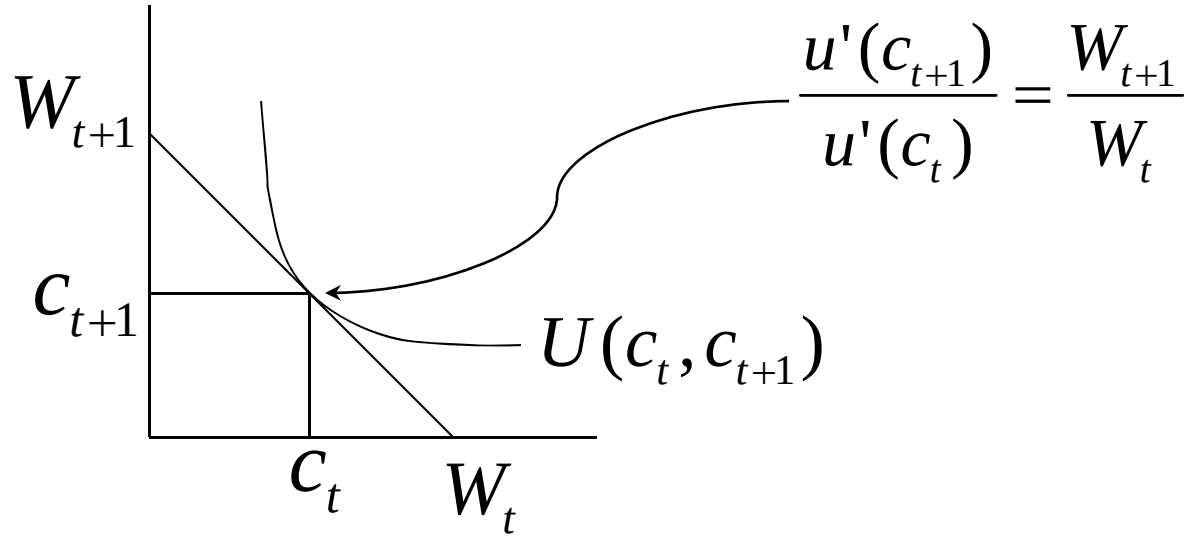
$$R_{it} = \alpha_i + \beta R_{mt} + \varepsilon_t$$

Economic Problem

To date, the impact of a food safety recall, as deadly and widespread as the 2008 Listeriosis recall, on a publicly traded firm's asset return has not been subjected to economic analysis.

- change in returns indicative of economic cost to firms due to catastrophic events.

Conceptual Framework



$$p_t^* = E_t\left[\beta \frac{u'(c_{t+1})}{u'(c_t)} x_{t+1}\right]$$

Hypotheses Tested

- The Listeria recall event has no impact on the mean or variance of Maple Leaf returns.
- The Listeria recall event has no impact on the mean or variance of returns to the index of publicly traded Canadian meat processing firms.

$$\hat{s}_i(\tau_1, \tau_2) = \frac{\hat{c}_i(\tau_1, \tau_2)}{\hat{\sigma}_i(\tau_1, \tau_2)}$$