Canadian Cattle Cycles and Cycle Effects of Market Shocks

Edgar Twine, James Rude and James Unterschultz
Department of Resource Economics and Environmental Sociology, University of Alberta
Corresponding author contact: etwine@ualberta.ca

Selected Poster prepared for presentation at the Agricultural & Applied Economics Association's 2013 AAEA & CAES Joint Annual Meeting , Washington, DC, August 4-6, 2013

Canadian Cattle Cycles and Cycle Effects of Market Shocks

Edgar Twine, James Rude and James Unterschultz

Department of Resource Economics and Environmental Sociology, University of Alberta

INTRODUCTION

- It has been well-established that beef cattle industries in the major beef producing countries are highly cyclical. The cyclicality not only plays into the decisions that individual producers make in optimizing their returns, but also has implications for government policy, especially in response to negative shocks to the industry.
- Although the contraction phase is generally perceived as the most challenging aspect of the cattle cycle for producers, the increasingly dynamic nature of cycles in terms of changing duration and amplitude has greatly diminished the predictability of cycles, rendering producers incapable of making accurate long-term predictions of supply and demand conditions.
- The Canadian beef cattle industry has experienced structural change since the 1970s and four major shocks in the last decade, both of which are likely to have impacted the Canadian cattle cycle.

OBJECTIVES

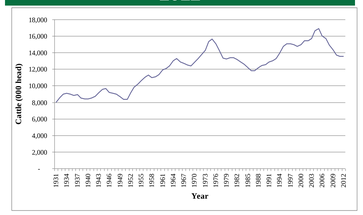
1. Estimate cycles in four industry variables:
   i. Total cattle inventories
   ii. Beef cow inventories
   iii. Beef supply
   iv. Beef prices
2. Estimate the cycle effects of two of the most recent market shocks:
   i. Appreciation of the Canadian dollar relative to the U.S. currency
   ii. Feed price escalation

METHODS

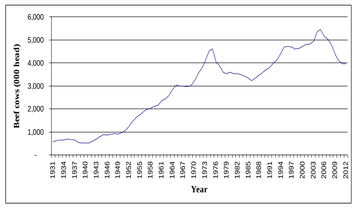
- An autocorrelation function (Bartlett, 1955) is generated for each variable for initial clues to the nature of cycles therein.
- Spectral analysis (Hamilton, 1994) is performed on each series to estimate the cycles.
- Intervention analysis (Enders, 2004) is combined with spectral analysis to estimate the impact of market shocks on the harmonic components of each series, and hence on the amplitudes of the cycles.

DATA

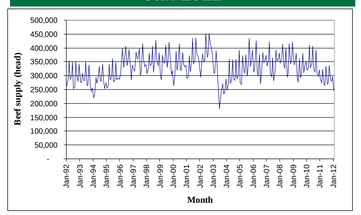
Total cattle inventories, 1931 – 2012



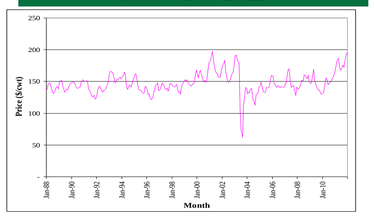
Beef cow inventories, 1931 – 2012



Monthly beef supply, Jan 1992 – Jan 2012



Monthly rail steer prices, Jan 1998 – Dec 2011

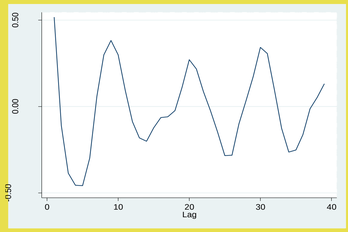


Spectral analysis requires that the series be stationary. Thus the trends in total cattle inventories and beef cattle inventories are filtered out using the Hodrick-Prescott (1997) high-pass filter.

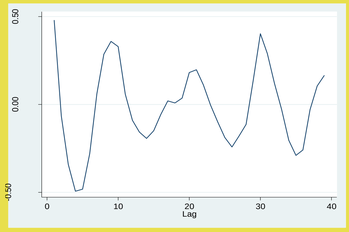
RESULTS

Autocorrelation functions as derived from Bartlett's formula

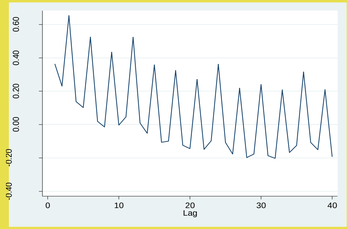
Autocorrelations of total cattle inventories



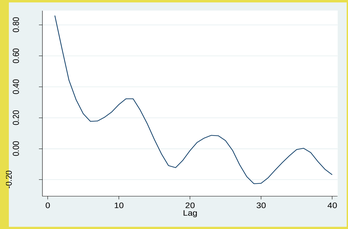
Autocorrelations of beef cow inventories



Autocorrelations of beef supply

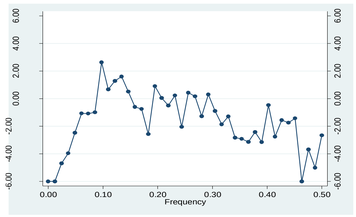


Autocorrelations of rail steer prices

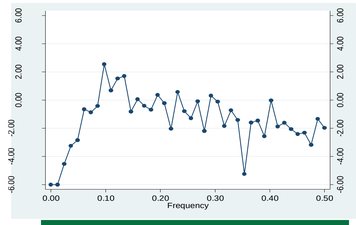


Plots of sample periodogram values against temporal frequencies

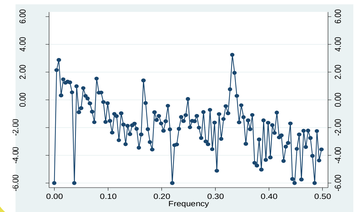
Periodogram of total cattle inventories



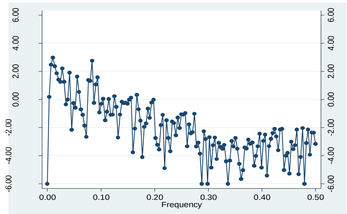
Periodogram of beef cow inventories



Periodogram of beef supply

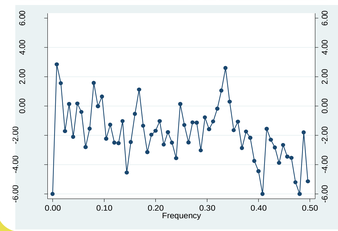


Periodogram of rail steer prices

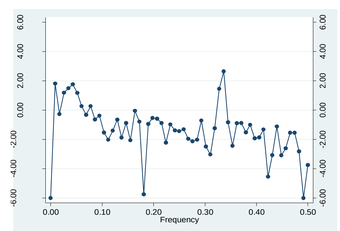


Effect of exchange rate shock on beef supply

Pre-shock periodogram of beef supply



Post-shock periodogram of beef supply



CONCLUSIONS

- Total cattle inventories, beef cow inventories, and beef supply are characterized by 10-year cycles.
- Beef prices have an 8-year cycle.
- Seasonal 3-month and 1-year cycles exist in beef supply and prices, respectively.
- Both exchange rate and feed price shocks significantly affected total cattle inventories but neither shock had an effect on beef cow inventories.
- The exchange rate shock significantly increased beef supply
- The exchange rate shock has led to a 9-month reduction in the duration of the beef supply cycle, and a 58% reduction in the cycle's peak amplitude. No effect is observed on the 3-month seasonal cycle.

References

Bartlett, M.S. 1955. *An Introduction to Stochastic Processes.* Cambridge: Cambridge University Press.
Enders, W. 2004. *Applied Econometric Time Series.* Second Edition, New Jersey: John Wiley and Sons.
Hamilton, J.D. 1994. *Time Series Analysis.* Princeton: Princeton University Press.
Hodrick, R.J. and E.C. Prescott. 1997. Postwar U.S. Business Cycles: An Empirical Investigation. *Journal of Money, Credit ,and Banking* 29: 1-16

For more information, please contact Edgar Twine: etwine@ualberta.ca