

# Beef and Milk Price Links in Turkey

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# Overview

- Retail beef and sheep prices have shown considerable increases between 2005 and 2012 in Turkey (TurkStat, 2013).
- The liquidation of dairy herd and limited imports are believed to have contributed to the increase in red-meat prices.
- In this study, we investigate the dynamic relationships along the beef and milk supply chains, using contemporary time-series analysis.
- Evaluation of the organic price links between milk and meat markets could help partially explain the reason behind recent beef price spikes.



# Background

- Beef prices have increased significantly in Turkey
- Retail beef prices rose 106 percent between 2005 -2012
- Retail sheep prices rose 138 percent between 2005-2012
- Overall food inflation rose 93 percent
- Animal feed index increased by 100 percent
- Retail milk prices increased by only 39 percent
- The press and policy makers argue that beef price spikes were due to the low milk prices leading to liquidation of dairy cows back in 2007-2008
  - Excessive liquidation of more than 400,000 dairy animals (Akman, 2010)
  - Dairy animals were slaughtered by almost twice the annual average in 2007 (Turkish Statistical Institute)
- It is believed that the inability of milk prices to keep up with the overall inflation led to pre-mature culling of dairy herd



# Literature

- Use of cattle as capital investment has been researched in the literature in detail (Jarvis, 1974; Rosen *et al.* 1994; Aadland and Bailey, 2001)
- The literature mostly concentrated on “cattle cycles”
- Cycles are the result of lags in gestation and maturation of animals, and also from economic behavior (Rosen *et al.*, 1994)
- Both demand and supply factors such as weather and herd health issues influence the cattle cycles (Crespi *et al.* 2010).



# Literature, cont.

- Rezitis and Stavropoulos (2012) showed a change in milk prices affects the meat supply, decreases in milk prices lead to increases in meat prices and supply
- Marsh (1988) found that prices declined between 4.6 and 6.4 percent at various levels due to dairy termination programs. The prices were back to equilibrium levels after six to eight quarters.
- Bobst and Davis (1984 and 1985) investigated the likely effects of more than normal culling of dairy herd on the beef prices and beef cow herds in the US
  - They predicted an immediate decline in beef price as a result of culling of dairy herd compared to no liquidation policy
  - However, by year-end two prices rebounded above what would have been at the no liquidation policy



# The chain of cause and effect

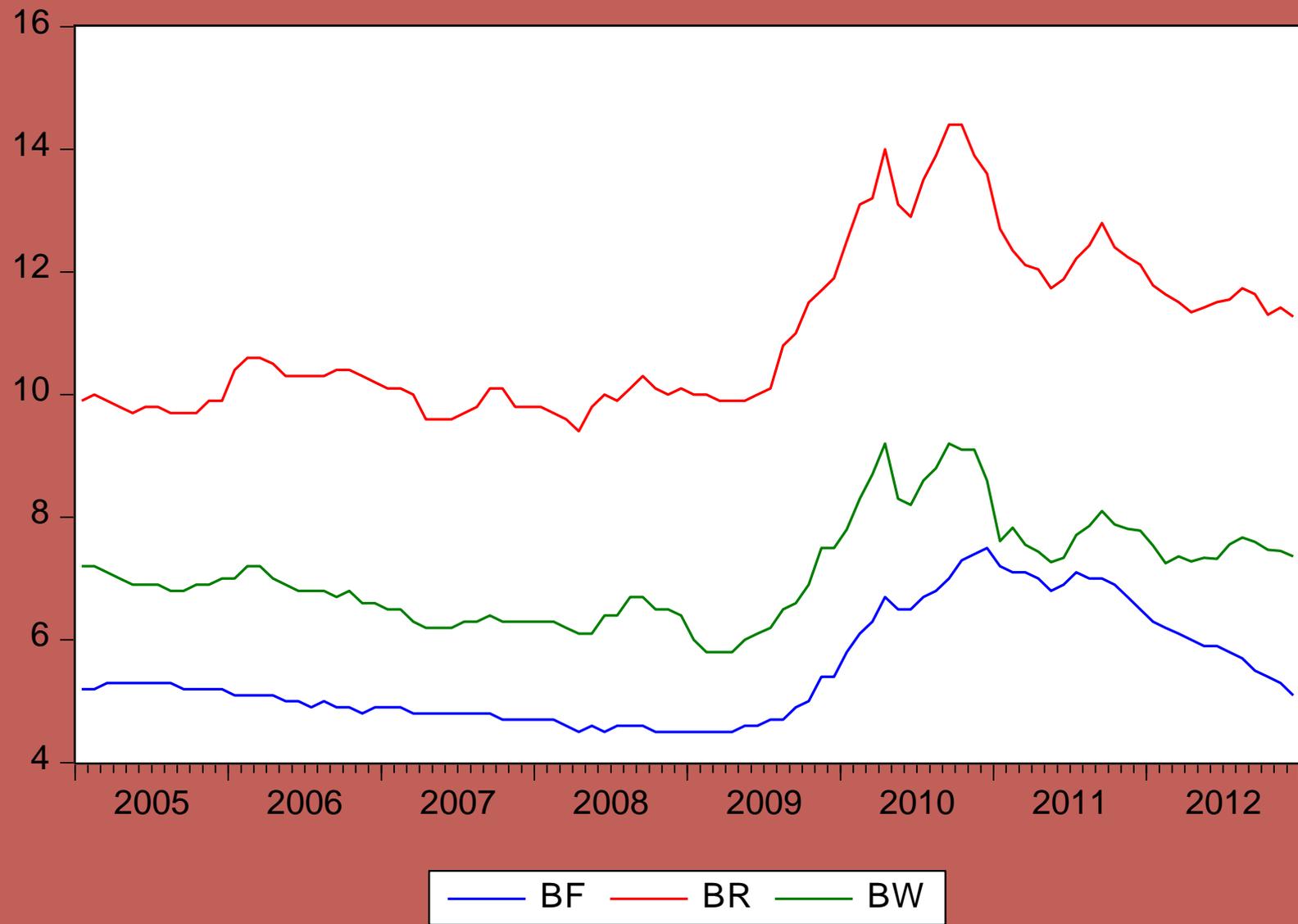
- Excessive culling of dairy cows in 2007-2008 led to increased supply of slaughtered animals which depressed wholesale beef prices temporarily due to the sudden increase in beef supply.
- Declining beef prices in the 2007-2008 period, in return, led to a declining calf crop starting in 2008: fewer cows in the current period meant fewer calves in the subsequent periods.
- Beef prices eventually responded to the shortage of cow and calf stocks and beef prices began to rise.



# Data

- Monthly farm, wholesale, and retail milk and beef prices from Turkish Statistical Institute for 2005:01-2012:12
- All prices in Turkish Lira per kilogram
- All prices deflated with the consumer price index (CPI)





# Econometric Methods & Results

## Time-Series Analyses

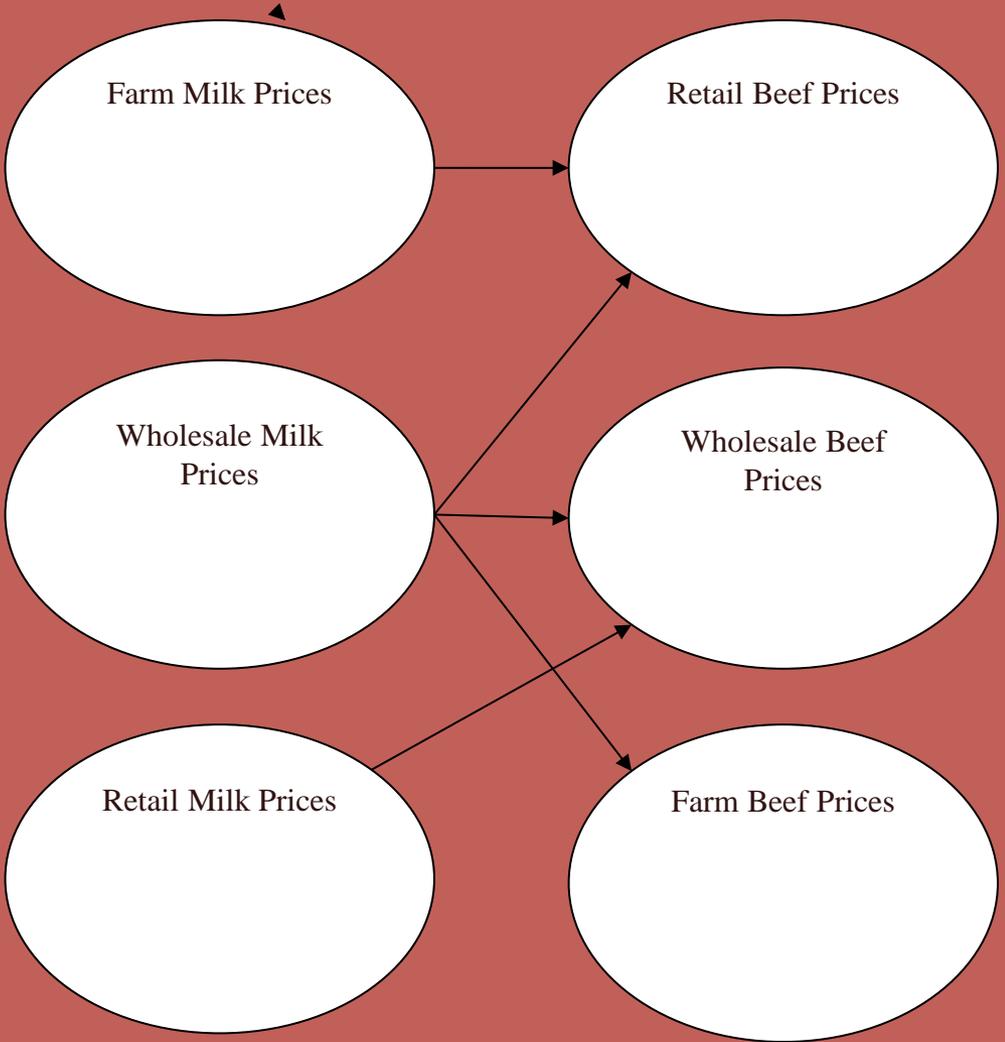
- ❏ **First**, using monthly milk and beef prices and a cointegration analysis, we found that there were three cointegrated vectors among the price series.
- ❏ **Second**, using Granger causality, we showed that causality existed between milk and beef price series with wholesale milk prices playing a pivotal role.
- ❏ **Finally**, impulse response functions traced the responses of beef prices to a one standard deviation change to wholesale milk prices over an 18 months horizon.

# Co-integration

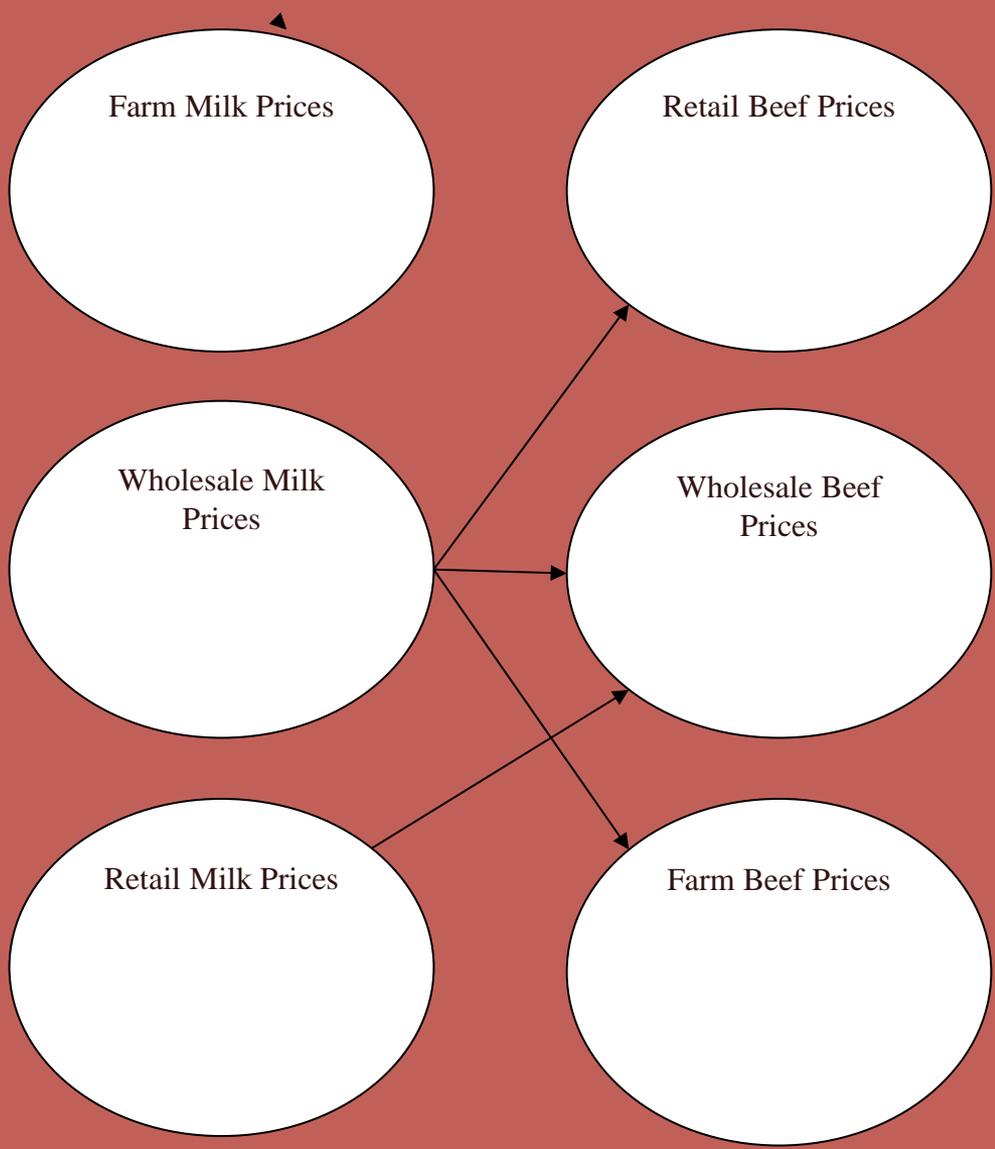
- Co-integration is used as a tool to evaluate market efficiency
- Can analyze both perfect and imperfect market conditions
- Co-integration of prices in distinct markets is an indication of price transmission and market integration
- Its convergence property is consistent with the hypothesis that arbitrage binds prices into a long-run relationship
- It is now commonplace to test the extent of price transmission through the supply chain by co-integration techniques



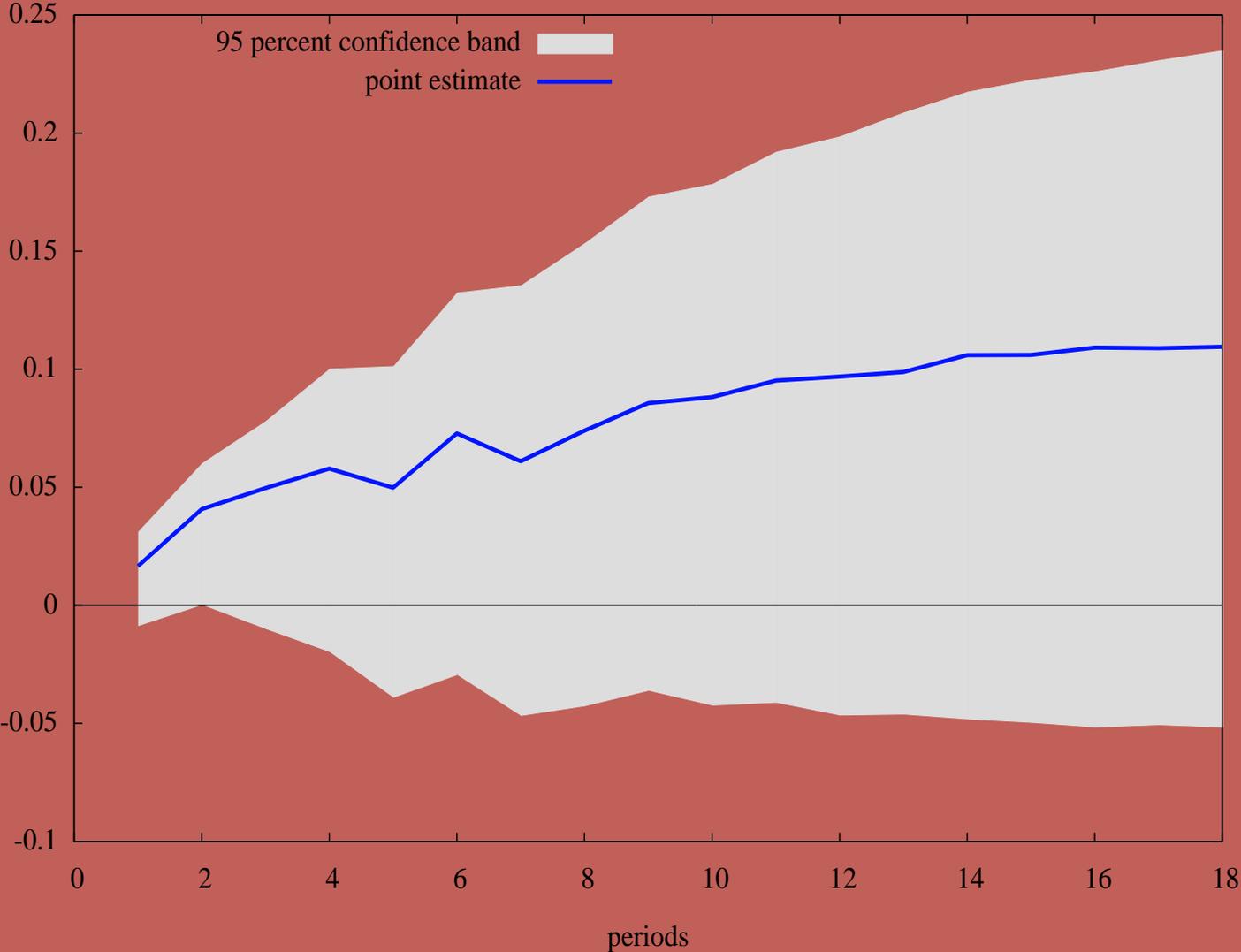
# Granger Causality Results for the Milk-Beef Relationships Over 12 Months



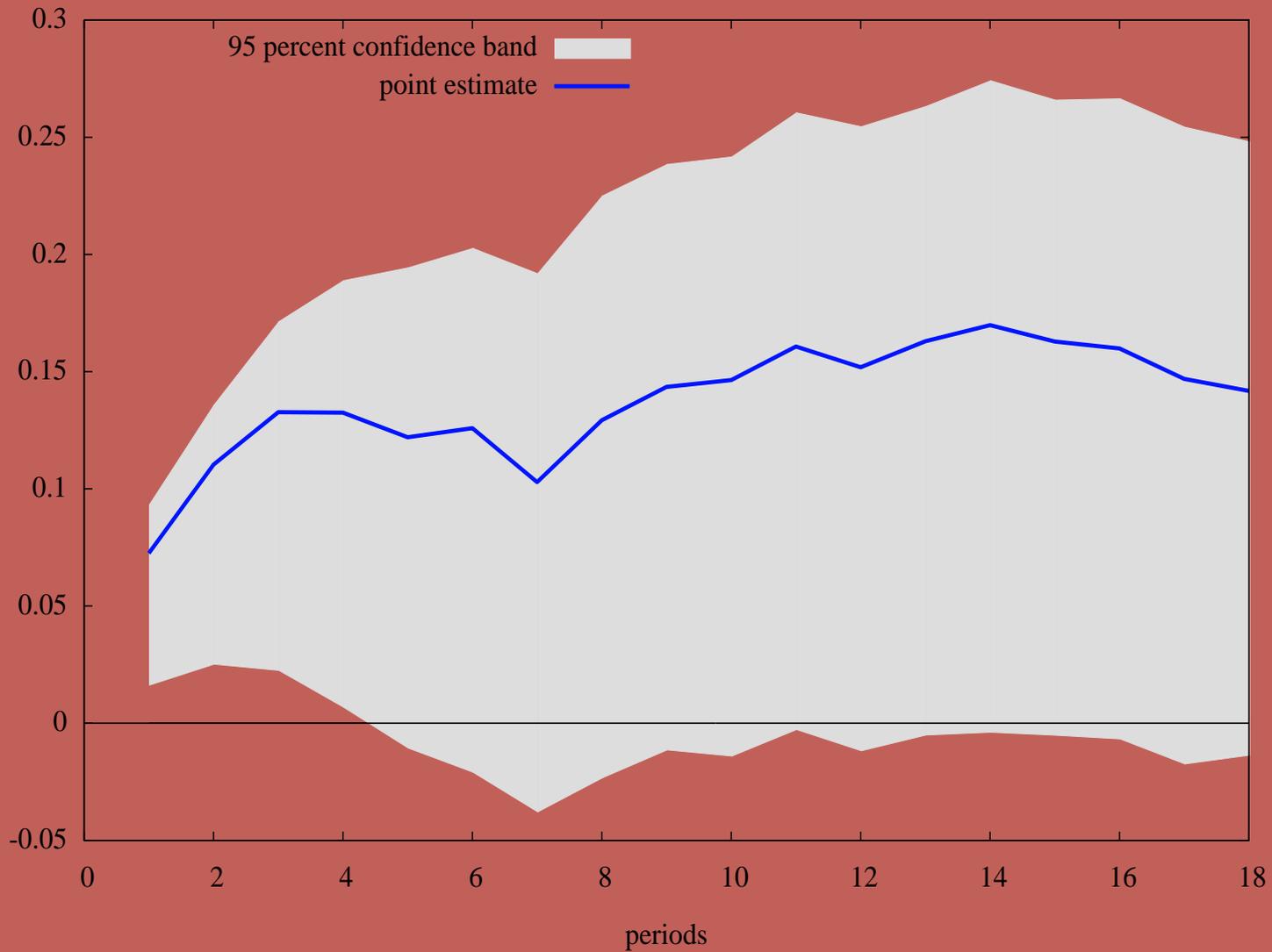
# Granger Causality Results of the Milk-Beef Relationships Over 18 Months



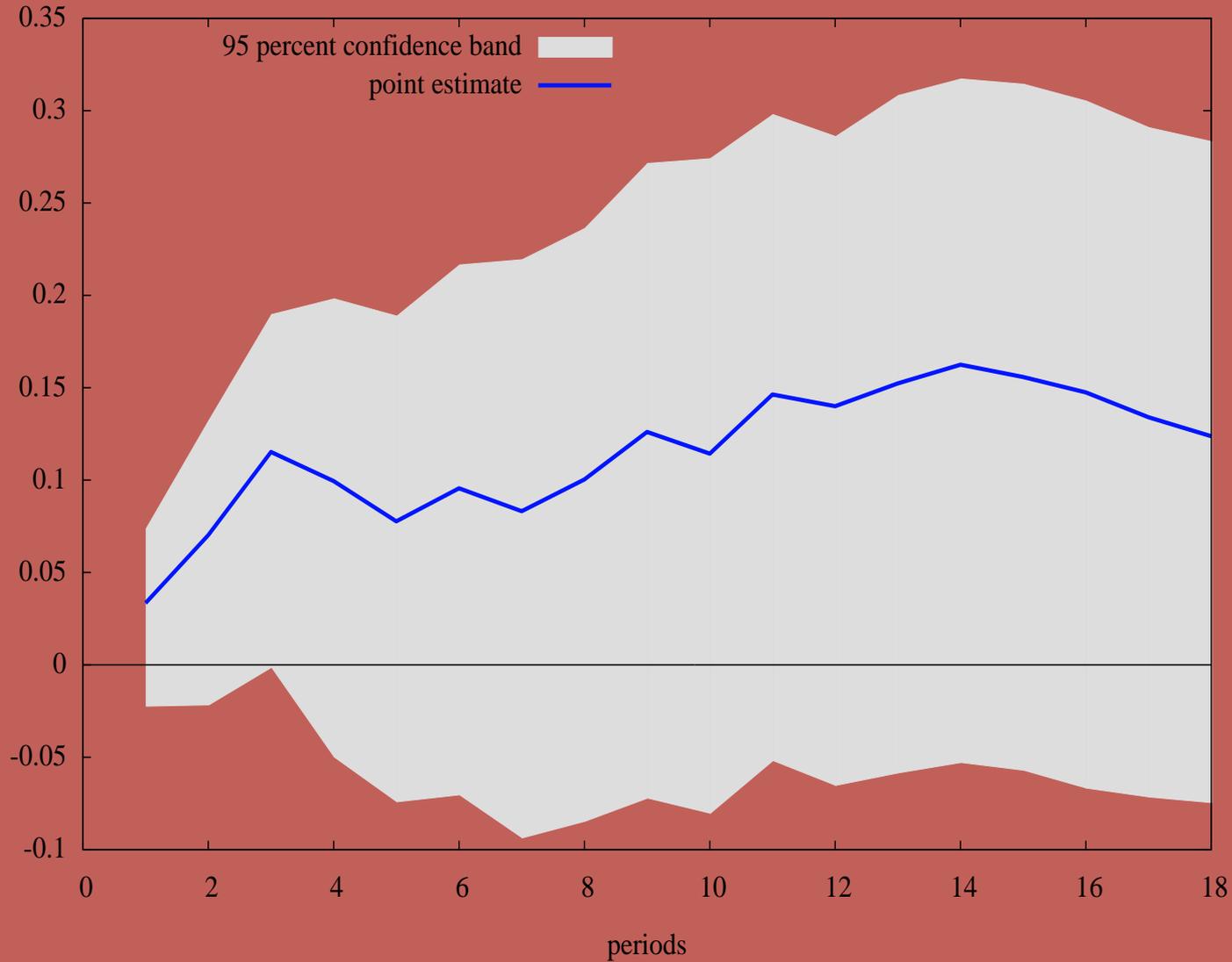
Response of BF(-1) to a shock in MW(-1)



Response of BW(-1) to a shock in MW(-1)



Response of BR(-1) to a shock in MW(-1)



# Conclusions

- Cows are not only consumption goods but are also investment goods.
- In countries like Turkey almost all cows are dairy cows with a dual purpose, and almost all calves, including the males destined for fattening, are born in either traditional or dairy farms.
- Above the average culling of still-productive cows results in supply shortages in subsequent years both because of premature culling of cows and because of missing calves and heifers.
- There is an initial decline of beef prices due to the liquidation of dairy herd, but, consequently, prices increase in the following years.
- Milk prices are the primary determinant of beef prices
- Our empirical results are consistent with that expectation and the literature previously discussed.



# Policy Implications

- Results important for policy development regarding dairy and beef markets.
- It points to the crucial role of policy makers and supply chain managers in charge of nation's food security.
- The results are expected to influence subsidies provided by the government to these markets.
- Such policy goals are to support producers and provide sustainable supply of milk and red meats in the country.
- It is also important for consumers, the products they purchase, and the prices they face.
- They demand access to affordable dairy and beef products, which take a sizable share of their consumption budget.
- Integrated macro level policies regarding dairy and beef markets may be more helpful rather than separate policy recommendations, given the organic nature of links between these two markets.

