Forecasting Meat Prices using Consumer Expectations from the Food Demand Survey (FooDS)

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Abstract

This research seeks to determine whether a new source of data from a monthly, nationwide survey of food consumers, the Food Demand Survey (FooDS), is a leading indicator of meat prices included in the Bureau of Labor Statistics (BLS) Consumer Price Index. This study relies on consumers' expectations about prices increasing or decreasing. For most meats studied, survey-based consumer price expectations Granger cause retail meat prices. Because the BLS releases price data with a lag, the survey data can be used as a leading indicator to project future retail price changes two times before the official government reports are released.

Key words: Granger causality, leading indicator, price expectation, Food Demand Survey (FooDS)

JEL Codes: Q11, Q13, D84

Prices, as revealed by market transactions, are the mechanism that equates marginal rates of substitution and transformation. Stated differently, prices help allocate goods to their most valued use. Not only that, prices reveal and aggregate information unknown to any individual market participant or government official (Hayek, 1945). Hence, prices of commodities affect which goods are produced and consumed as well as the welfare of consumers and firms. For this reason, among others, changes in the prices for goods and services are measured and reported by government agencies and are predicted by academics, businesses, and private consultants. One of the most well-known reported prices is the Consumer Price Index (CPI) published by the Bureau of Labor Statistics. In this study, we focus on the prices of several meat items that make up the food component of the CPI.

Because of private and public interest in changing food prices, several entities attempt to forecast future food-related CPI values. For example, the United States Department of Agriculture (USDA) Economic Research Service (ERS) reports annual forecasts (updated monthly) for the food CPI. The ERS forecasts annual changes in food CPI using an autoregressive moving average (ARMA) framework (Kuhns et al. 2015). Other, similar approaches by academics, private industry consultants, and government agencies (ERS), have been used to forecast the food CPI (e.g., Joutz 1997). Our interests lie in predicting prices of disaggregate meat products, but we focus on monthly (rather than annual) values for disaggregate (rather than aggregate) food products. More importantly, we consider whether consumer price expectations, as measured in a monthly tracking Food Demand Survey (FooDS), are leading indicators of actual retail beef, pork, and chicken prices. In contrast to models like that used by the ERS, which use past prices to forecast future prices, our model uses consumers' forward-looking expectations to forecast future prices.

Accurate price data can help firms better plan and adjust to market conditions. For instance, public data and associated situation and outlook extension programs are argued to improve producer and consumer welfare by providing more accurate price expectations (Irwin, 1997; Freebairn, 1976, 1978; Lusk, 2013). Studies such as Antonovitz and Roe (1986), Bradford and Kelejian (1978), and Arrow (1951), have attempted to estimate the financial and social welfare benefits associated with improved price expectations that accrue from firms being able to more optimally determine the quantity to produce.

While previous efforts at forecasting food prices have tended to rely on econometric models using auto-regressive frameworks, there is evidence from studies that suggest futures markets can help produce forecasts of future outcomes with lower prediction errors. Specifically, futures prices in an efficient market provide forecasts of subsequent spot prices that are at least as accurate as any other forecast (Tomek 1997; Colino and Irwin 2010). In layman's terms, it should not be possible to "beat the market" in terms of forecast accuracy (Colino and Irwin 2010), as futures prices should reflect all available information. Colino and Irwin (2010) note that there have been numerous empirical studies that compare the accuracy of outlook forecasts and futures prices such as Just and Rausser (1981), Bessler and Brandt (1992), Irwin, Gerlow, and Liu (1994), Bowman and Husain (2004), and Sanders and Manfredo (2004, 2005). Excluding a few exceptions, these studies find that outlook forecasts are no more accurate, and often less accurate, than comparable futures prices.

While there are futures markets for some farm-level products such as live cattle, there are not futures markets for retail cuts of beef, for instance, rib-eye. Although live cattle futures market prices may help in estimating future retail beef prices, it is unclear how accurate a forecast it can provide, especially considering that the farmers' share of total beef, pork and other

meats food dollar is only 0.228 (i.e., about 77.2% of the cost of the retail product is comprised of goods beyond the agricultural commodity in 2007) (Canning 2015). In addition, there are many farm and retail products that are not traded or sold in futures markets (such as chicken).

Aside from historical retail prices or farm-commodity futures prices, are there other types of data which might prove useful in predicting retail meat prices? Surowiecki (2005) popularized the idea that large groups may make more accurate predictions than any one expert. Likewise, Treynor (1987), Forsythe et al. (1992), Johnson (1998), and Maloney and Mulherin (2003) show that the aggregation of decentralized, independent factions with diversified opinions lead to optimal solutions and accurate predictions in a variety of contexts.

Studies conducted by Anderson et al. (2011, 2013) suggest that information collected from consumer surveys are beneficial when forecasting future prices. In these studies, consumer predictions of future gasoline prices yielded increased forecast accuracy relative to forecasts based on historical monthly prices. Furthermore, Zakrzewicz, Brorsen, and Briggeman (2012, 2013) found that survey-based land value estimates elicited from agricultural bankers by the Federal Reserve Bank of Kansas City are leading indicators of land values and land value changes reported by the USDA.

These studies, and others like them, suggest that there may be merit in using forward-looking information gathered from surveys of diverse individuals. The objective of this research is to determine whether survey-based data on consumers' expectations of meat price changes are leading indicators of BLS retail meat values. We rely on a unique data set created by the Food Demand Survey (FooDS) that has been repeated monthly since May 2013. The next section describes these data. We then describe the methods used to determine whether price expectations

are leading indicators of actual retail price changes as reported by the BLS. The results are presented, and then we conclude.

Data

This section discusses the consumer survey data from (FooDS) and how the price expectation measures are derived. Retail price data from BLS are then discussed.

Consumer Survey Data from FooDS

FooDS is a monthly, online survey completed by at least 1,000 consumers each month. The first FooDS survey was administered in May of 2013 and it has since been issued consistently each month. FooDS is sent to respondents on the 10th of every month unless the 10th falls on Saturday or Sunday. If the 10th falls on a weekend, FooDS is sent the following Monday. The survey is sent to a sample of consumers in a panel maintained by Survey Sampling Incorporated (SSI). After completion of the survey each month, responses are weighted to match the U.S. population in terms of age, gender, education, and region of residency. We use aggregate results from FooDS in our econometric models through July 2015, which means we have 26 monthly observations.

Among other questions on the survey, respondents are asked whether they expect the price of beef, pork, and chicken to be higher in the next two weeks compared to the previous two weeks. The manner in which respondents were asked about price and consumption expectations is shown in Figure 1.

To derive an aggregate measure of price expectations in each month, *t*, we calculated the proportion of respondents who agreed that prices would increase and subtracted it from the

proportion of respondents who agreed that prices would decrease. The proportion of respondents who neither agreed nor disagreed was subtracted from one and multiplied by the aforementioned measure. This allows for a price expectation measurement weighted by those who had an opinion regarding the future of meat prices. Formally, consumer price expectations (PE) for meat type j in month t is calculated as:

$$PE_{jt} = \left(1 - \frac{\sum_{i=1}^{nt} NAD_{ijt}}{n_t}\right)\left(\frac{\sum_{i=1}^{nt} AGREE_{ijt}}{n_t} - \frac{\sum_{i=1}^{nt} DISAGREE_{ijt}}{n_t}\right)$$

where PE_{jt} is the consumer price expectation for meat j=beef, pork, or chicken in each time period (month) t, where $t = 1, ..., 26$, n is the total number of respondents in time period t. $AGREE_{ijt}$, is a 0/1 dummy variable indicating whether respondent i either strongly agreed or agreed that the price of meat type j would increase in the coming weeks. $DISAGREE_{ijt}$, is a 0/1 dummy variable indicating whether a respondent either strongly disagreed or disagreed that the price of meat type j would increase in the coming weeks. Likewise, NAD_{ijt}, is a 0/1 dummy variable indicating that a respondent neither agreed nor disagreed that the price of meat type j would increase in the coming weeks.

BLS Retail Prices

The Bureau of Labor Statistics (BLS) publishes average U.S. city prices of various consumer products on a monthly basis. Due to processing time, the monthly prices reported by the BLS are released two to three weeks following the month in question (BLS 2014). For example, the average prices in July are not released until mid to late August. Average U.S. city prices for uncooked ground beef (APU0000FC1101), uncooked beef steak (APU0000FC3101), boneless chicken breast (APU0000FF1101), and all pork chops (APU0000FD3101) for May 2013 to June

2015 were collected from the BLS website. The BLS does not report average U.S. city prices for deli ham or chicken wings. However, in order to provide a point of comparison with the FooDS data, we also collected BLS boneless ham excluding canned (APU0000704312) and bone-in chicken leg (APU0000706212) prices, respectively. Additionally, aggregate beef, pork, and chicken prices were gathered from the Economic Research Service (ERS) Meat Price Spreads database; these statistics are based on BLS price data.

Methods

We seek to determine if consumer expectations are leading indicators of retail meat prices. FooDS data for a given month are known at least two months prior to the time when BLS releases prices corresponding to the same month. Thus, we can predict prices in the current time period, say July, and update our July estimates the following month (August) before the BLS release of the July data occurs. In what follows, we will refer to our estimates relative to the BLS release date. For example, using July FooDS data to forecast (in July) the July BLS price released in August, will be referred to as a "two-period ahead forecast" and using the August FooDS data to forecast (in August) the July BLS price will be referred to as a "one period ahead forecast."

After considering some simple correlations between consumer price expectations and BLS prices, we move to econometric models that seek to determine whether FooDS data is a leading indicator of BLS prices even after controlling for past BLS prices. Our main analysis focuses on the following ordinary least squares (OLS) models to determine if PE is a leading indicator of BLS prices:

(1) $BLSPrice_{j,t} = \beta_0 + \beta_1 BLSPrice_{j,t-2} + \beta_2 PE_{j,t} + \varepsilon_{j,t}$

(2) $BLSPrice_{j,t} = \gamma_0 + \gamma_1 BLSPrice_{j,t-1} + \gamma_2 PE_{j,t+1} + \varepsilon_{j,t}$

where $BLSPrice_{j,t}$ represents the realized price (gathered from the BLS) of food product *j* in

time period *t*, $PE_{j,t}$ represents price expectations measured in FooDS for food product *j* in time

period *t*. Both models specify BLS prices in time period *t* as a function of the BLS price two or

three periods prior to the release date. This specification is adopted because BLS does not release

price data timely enough to use a one-period lag in real-world forecasting. Model 1 uses current

FooDS responses (e.g., June) to estimate current BLS prices (also June). On the other hand,

model 2 uses updated, and technically the most current FooDS responses (e.g., July), to estimate

the previous month's BLS prices (i.e. June). While this might seem a bit awkward, we are in

possession of FooDS data in month *t* before the BLS releases price data for month *t*, so it is

possible to explore whether consumer expectations gathered in FooDS Granger causes actual

prices reported by the BLS in the same period. Because FooDS information is available before

the BLS reports meat prices, retail meat prices can be estimated using expected price measures

from FooDS two time periods before the BLS reports average U.S. prices. Again, model 1 is

referred to as a two period ahead model while model 2 forecasts one period ahead (relative to

BLS release date). Figure 2 presents an example of the timeline of survey administration, price

estimations, and BLS price release schedule.

Given the relatively small sample size, stationarity tests lack power; nonetheless, we test

for the presence of a unit root. For equations (1) and (2), we failed to reject the null hypothesis

that a unit root exists for all meats; thus, we take first differences of all variables (for sake of

comparison, the appendix shows the results associated with models 1 and 2 estimated in levels).

Keeping in mind the BLS price release schedule, the first difference of BLS prices and price

expectations are defined as: $\Delta BLSPrice_{j,t-2} = BLSPrice_{j,t-2} - BLSPrice_{j,t-3}$,

$\Delta BLSPrice_{j,t-1} = BLSPrice_{j,t-1} - BLSPrice_{j,t-2}$, and $\Delta PE_{j,t} = PE_{j,t} - PE_{j,t-1}$, respectively.

The null hypothesis of a second unit root is rejected for all meat price expectation variables. Additionally, we reject the null hypothesis that a second unit root exists in all meat BLS price variables other than pork chop and aggregate pork. As a result, we estimate the model(s) in difference form. Also, since the FooDS variable measures expected changes, the first difference model is more consistent with the survey data. Granger causality is examined by testing whether the coefficients on the survey-based price expectations variables are equal to zero.

Results

The correlation between BLS prices and FooDS variables were calculated to explore the same-period, linear relationships between the variables. As seen in Table 1, a statistically significant positive correlation exists for all beef and pork price measures but for none of the chicken price measures.

Two Periods Ahead Forecast Models

Table 2 shows that beef steak, aggregate beef, and pork chop price expectation changes in time period t are leading indicators of actual beef steak, aggregate beef, and pork chop price changes at the 95% confidence level. Additionally, expected price measurement changes of ground beef are leading indicators of actual ground beef price changes at the 90% confidence level. Similarly, aggregate pork expected price change is statistically significant at the 99% confidence level, and is considered a leading indicator for actual aggregate pork price changes. Therefore, we reject the null hypothesis that the coefficient associated with FooDS price expectations is equal to zero at the 99% confidence level for aggregate pork, at the 95% confidence level for beef steak and

aggregate beef, and at the 90% confidence level for ground beef. We can interpret beef steak results, for example, by stating that for every expected one dollar price increase in beef prices (e.g., $PE_{beef,July}$), retail beef steak prices ($BLSPrice_{beef\ steak,July}$) are estimated to increase by an average of \$1.51.

Conversely, none of the chicken food product expected price changes (chicken breast, chicken wing, nor aggregate chicken) are leading indicators of actual chicken prices. Thus, we fail to reject the null hypothesis of no Granger causality because sufficient evidence does not exist to suggest that chicken breast, chicken wing, and aggregate chicken expected prices are leading indicators of their respective actual prices in like time periods. The same is the case for deli ham.

One Period Ahead Forecast Models

Results in Table 3 indicate that of the meat food products considered, aggregate pork, chicken breast, and aggregate chicken expected price changes are leading indicators of the respective food prices at a statistically significant level. Specifically, we reject the null hypothesis at the 90% confidence level for chicken breast and aggregate chicken, and, similarly, at the 95% confidence level for aggregate pork. An interpretation of chicken breast results suggests that for every expected one dollar increase in the price of chicken (e.g., $PE_{chicken,July}$), retail chicken breast prices ($BLSPrice_{chicken\ breast,July}$) are estimated to decrease by \$1.08, on average.

Moreover, results indicate that none of the beef food price expectation changes evaluated are leading indicators of aggregate beef price changes. Therefore, we fail to reject the null hypothesis because sufficient evidence fails to exist and support that current beef steak, ground

beef, and aggregate beef price expectation changes are leading indicators of respective beef prices.

Expected deli ham price changes do not explain actual deli ham price changes in time period t at a statistically significant level. Therefore, we fail to reject the second null hypothesis because sufficient evidence does not exist to suggest otherwise. Additionally, the expected price of pork chop (as measured in FooDS) is not a leading indicator of pork chop prices from the previous period.

Figures 3 through 11 graphically depict the relationship between price change estimates and actual price changes. For the most part, consumers accurately anticipate the directional change in meat prices. It is important to note the small confidence intervals associated with the estimates. There are few instances in which actual price changes do not fall within the confidence intervals for estimated price changes. In fact, the mean squared error (MSE) values indicate that beef steak, aggregate beef, pork chop, and aggregate chicken price changes are most accurately estimated two periods ahead while aggregate pork and chicken breast price changes are most accurately estimated one period ahead of the BLS release date. Ground beef, deli ham, and chicken wing price change estimates exhibit the same MSE values whether estimated one period or two periods ahead. Therefore, consumers' price expectations help anticipate price increases and decreases.

Conclusions

The results from this article suggest that changes in U.S. consumers' beef and pork price expectations obtained through FooDS are leading indicators of beef steak, ground beef, aggregate beef, pork chop, aggregate pork, chicken wing, and aggregate chicken price changes in

the U.S. when estimated one and/or two periods ahead. For current prices, the survey serves as a leading indicator because the results are available before the USDA report

Although results suggest there is some explanatory power in the aggregation of (FooDS) survey responses, there are some issues that might be changed to improve forecast performance. Changes with the survey itself might be beneficial. The main problem with the survey pertains to the timing of administration. It proved difficult and a little awkward to conduct analyses using data collected at a different time than when other necessary data were released. However, if disaggregated (daily or weekly) prices were available, the analyses would prove less difficult and potentially more accurate. Although asked differently in FooDS, respondents are asked comparable questions to those in the highly regarded and closely followed Conference Board's Consumer Confidence Index Survey and the Michigan Survey of Consumers administered by the University of Michigan. Furthermore, as mentioned earlier, FooDS has been administered for a little over two years; thus, the sample size is relatively small. Consequently, limited market and price shocks have been observed. That is, prices have been following a particular trend unlike they did during the recessionary period. It is important to note that for the duration of FooDS, consumers have expected retail prices of beef, pork, and chicken to increase each month. Furthermore, U.S. consumers indicate that they expect to consume less beef and pork each month and more chicken. Taking the aforementioned expectations and upward trending prices into consideration, it would be interesting to see how consumer (price and consumption) expectations change in times of downward price movements. In essence, a richer data set containing more volatility within prices coupled with price expectations should aid in increased price forecast accuracy, regardless of the market condition. Hence, as time passes, not only will

shocks be observed, but additional explanatory variables could also be considered as leading

indicators of retail meat prices due to increased degrees of freedom.

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To what extent do you agree or disagree with the following statements regarding your purchases in the next two weeks as compared to the previous two weeks?

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I plan to buy more beef	◎	◎	◎	◎	◎
I plan to buy more chicken	◎	◎	◎	◎	◎
I plan to buy more pork	◎	◎	◎	◎	◎
I plan to eat out more	◎	◎	◎	◎	◎
I expect the price of beef to be higher	◎	◎	◎	◎	◎
I expect the price of pork to be higher	◎	◎	◎	◎	◎
I expect the price of chicken to be higher	◎	◎	◎	◎	◎

Figure 1. Consumer Expectation Questions

June 10, 2015
- June FooDS survey administered

June 13, 2015
- June FooDS survey closes
- Data aggregated and analyzed
- 1st June retail meat prices estimated using June FooDS data
- 2nd May retail meat prices estimated using June FooDS data

June 18, 2015
- BLS releases average retail prices for May 2015

July 10, 2015
- July FooDS survey administered

July 13, 2015
- July FooDS survey closes
- Data aggregated and analyzed
- 1st July retail meat prices estimated using July FooDS data
- 2nd June retail meat prices estimated using July FooDS data

July 17, 2015
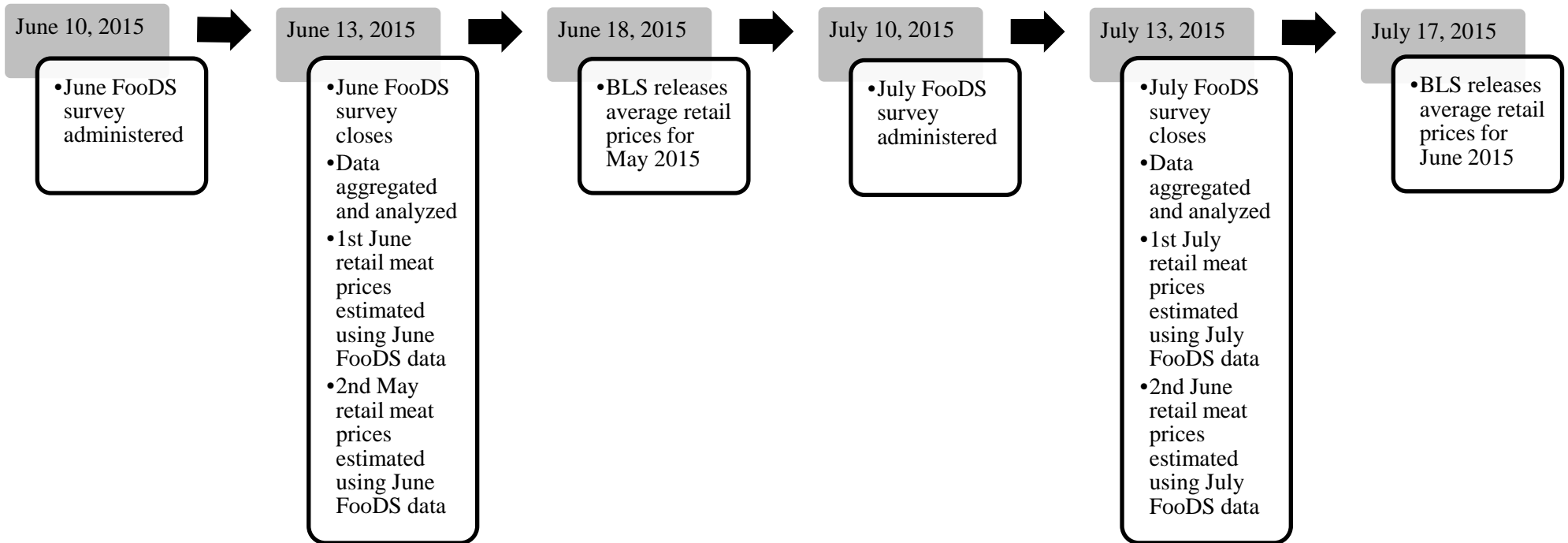- BLS releases average retail prices for June 2015

Figure 2. Timeline of FooDS survey administration, price estimations, and BLS price release dates

Table 1. Correlations Between Same-Period BLS Price and Survey-Based Expected Prices in Levels

Item	Correlation
Ground beef	0.44**
Beef steak	0.47**
Aggregate beef	0.53***
Pork chop	0.73***
Deli ham	0.48**
Aggregate pork	0.74***
Chicken breast	-0.32
Chicken wing	-0.31
Aggregate chicken	-0.24

Note: One asterisk (*) represents significance at the 90% confidence level, two asterisks at the 95% level, and three asterisks at the 99% level.

Table 2. Two Periods Ahead Forecast Models in First Differences

Variables	Beef Steak	Ground Beef	Aggregate Beef	Pork Chop	Deli Ham	Aggregate Pork	Chicken Breast	Chicken Wing	Aggregate Chicken
Constant	0.068***	0.041***	0.057***	0.012	0.0004	-0.007	-0.008	-0.001	0.0001
	(0.024)	(0.014)	(0.019)	(0.017)	(0.02)	(0.011)	(0.014)	(0.008)	(0.006)
$\Delta BLSPrice_{t-2}$	-0.118	-0.099	-0.27	0.034	0.054	0.53***	0.061	0.28	0.29
	(0.212)	(0.21)	(0.19)	(0.187)	(0.21)	(0.17)	(0.22)	(0.25)	(0.26)
PE	1.51**	0.706*	1.28**	1.857**	0.94	1.89***	0.11	0.014	-0.07
	(0.71)	(0.35)	(0.54)	(0.82)	(0.94)	(0.54)	(0.59)	(0.33)	(0.25)
Diagnostic Statistics									
MSE	0.0097	0.003	0.006	0.006	0.009	0.003	0.005	0.001	0.0008

Note: Standard errors are in parenthesis. One asterisk (*) represents significance at the 90% confidence level, two asterisks at the 95% confidence level, and three asterisks at the 99% confidence level.

Table 3. One Period Ahead Forecast Models in First Differences

Variables	Beef Steak	Ground Beef	Aggregate Beef	Pork Chop	Deli Ham	Aggregate Pork	Chicken Breast	Chicken Wing	Aggregate Chicken
Constant	0.05*	0.028*	0.04*	0.013	0.002	-0.005	0.00007	-0.003	-0.0004
	(0.03)	(0.01)	(0.02)	(0.018)	(0.02)	(0.01)	(0.013)	(0.007)	(0.005)
$\Delta BLSPrice_{t-1}$	0.088	0.28	0.089	0.25	0.19	0.82***	-0.23	-0.34	-0.38
	(0.23)	(0.22)	(0.221)	(0.20)	(0.20)	(0.15)	(0.20)	(0.21)	(0.21)
PE	-0.041	-0.22	0.47	1.29	-0.66	1.18**	-1.08*	-0.30	-0.33*
	(0.777)	(0.37)	(0.612)	(0.90)	(0.93)	(0.48)	(0.523)	(0.28)	(0.21)
Diagnostic Statistics									
MSE	0.012	0.003	0.008	0.008	0.009	0.002	0.0037	0.001	0.0006

Note: Standard errors are in parenthesis. One asterisk (*) represents significance at the 90% confidence level, two asterisks at the 95% confidence level, and three asterisks at the 99% confidence level.

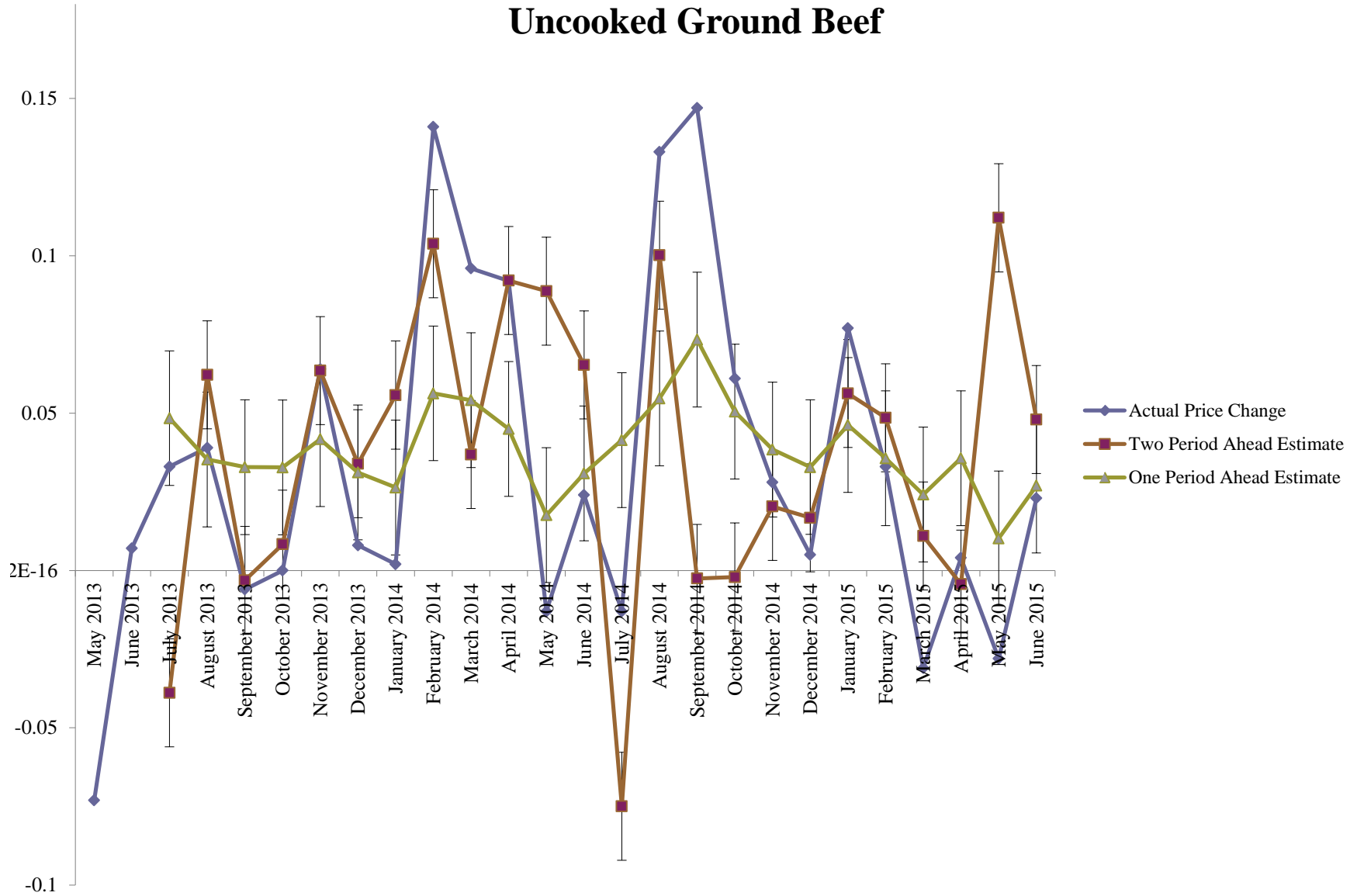**Figure 3.** Uncooked Ground Beef Retail Price Changes, Initial and Updated Price Change Estimates
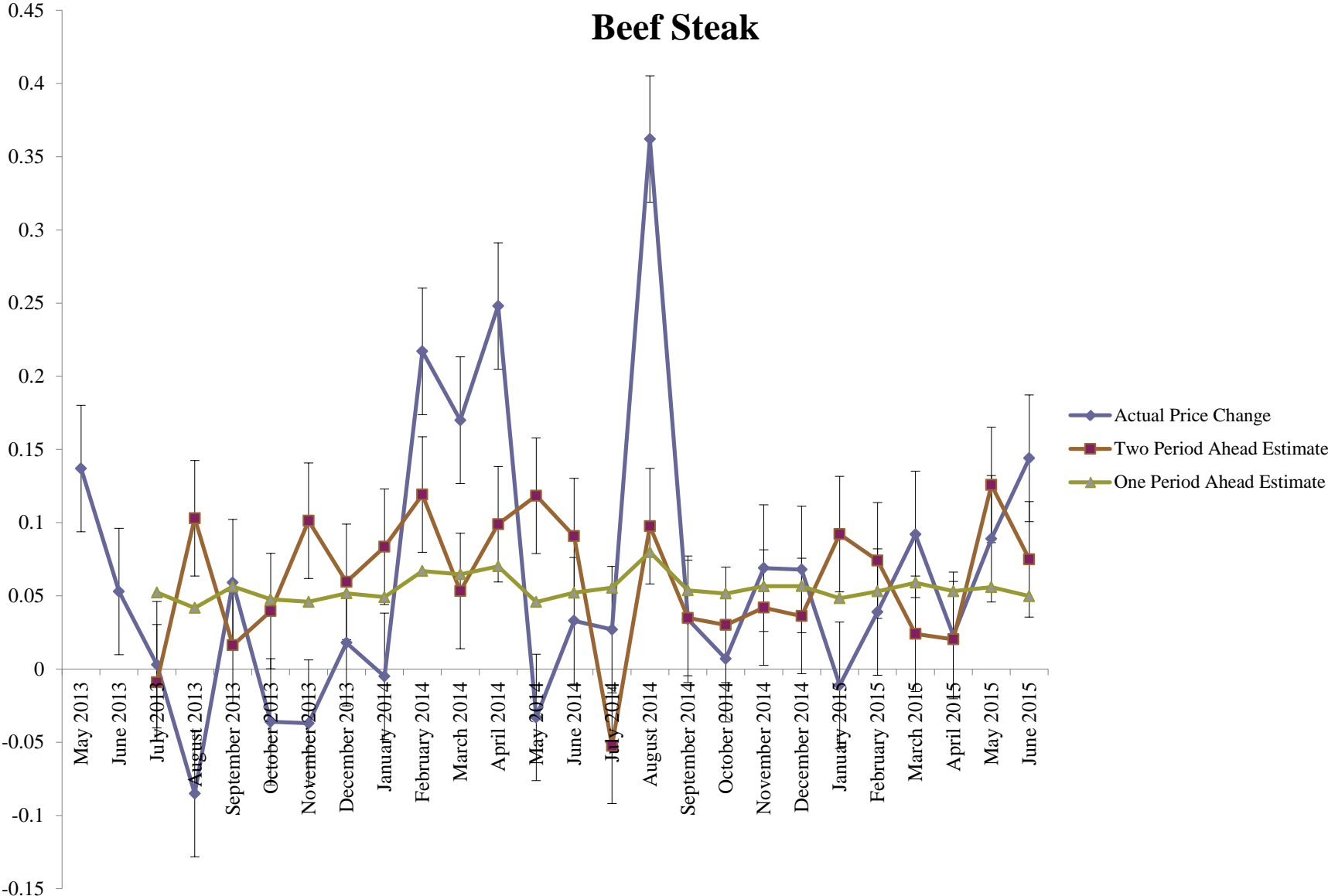
Figure 4. Uncooked Beef Steak Retail Price Changes, Initial and Updated Price Change Estimates
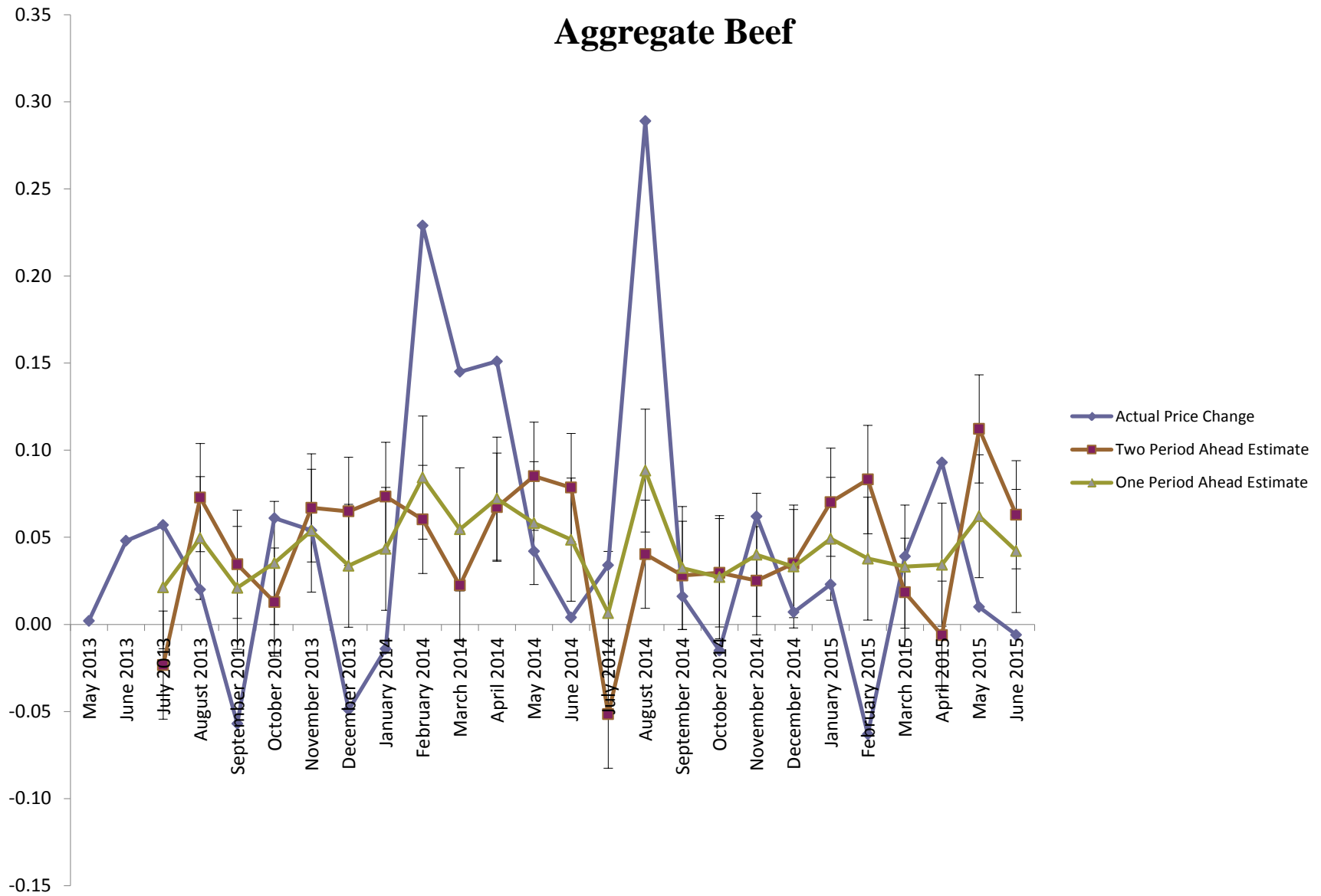
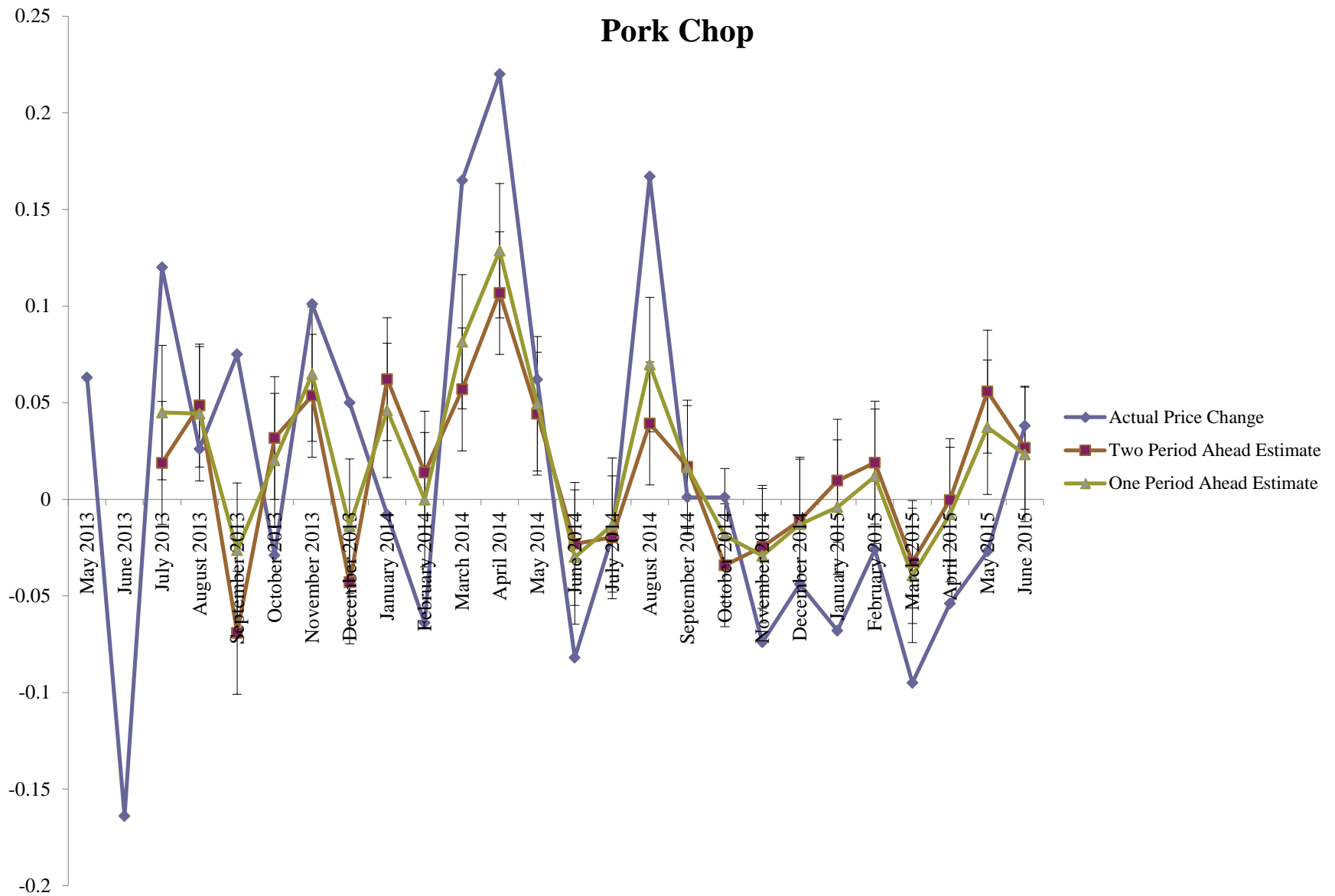**Figure 5.** Aggregate Beef Retail Price Changes, Initial and Updated Price Change Estimates

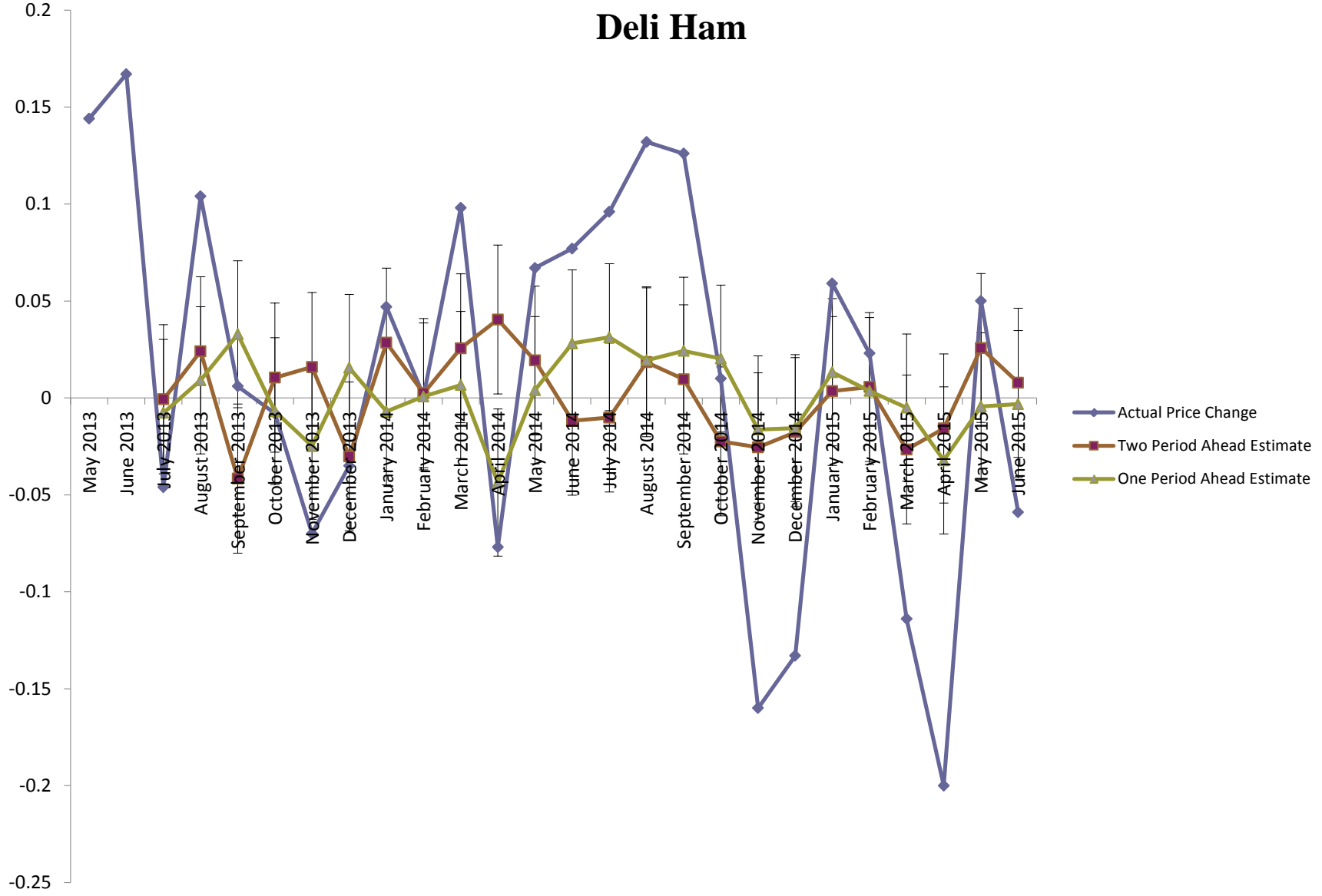**Figure 6.** Pork Chop Retail Price Changes, Initial and Updated Price Change Estimates

Figure 7. Deli Ham Retail Price Changes, Initial and Updated Price Change Estimates
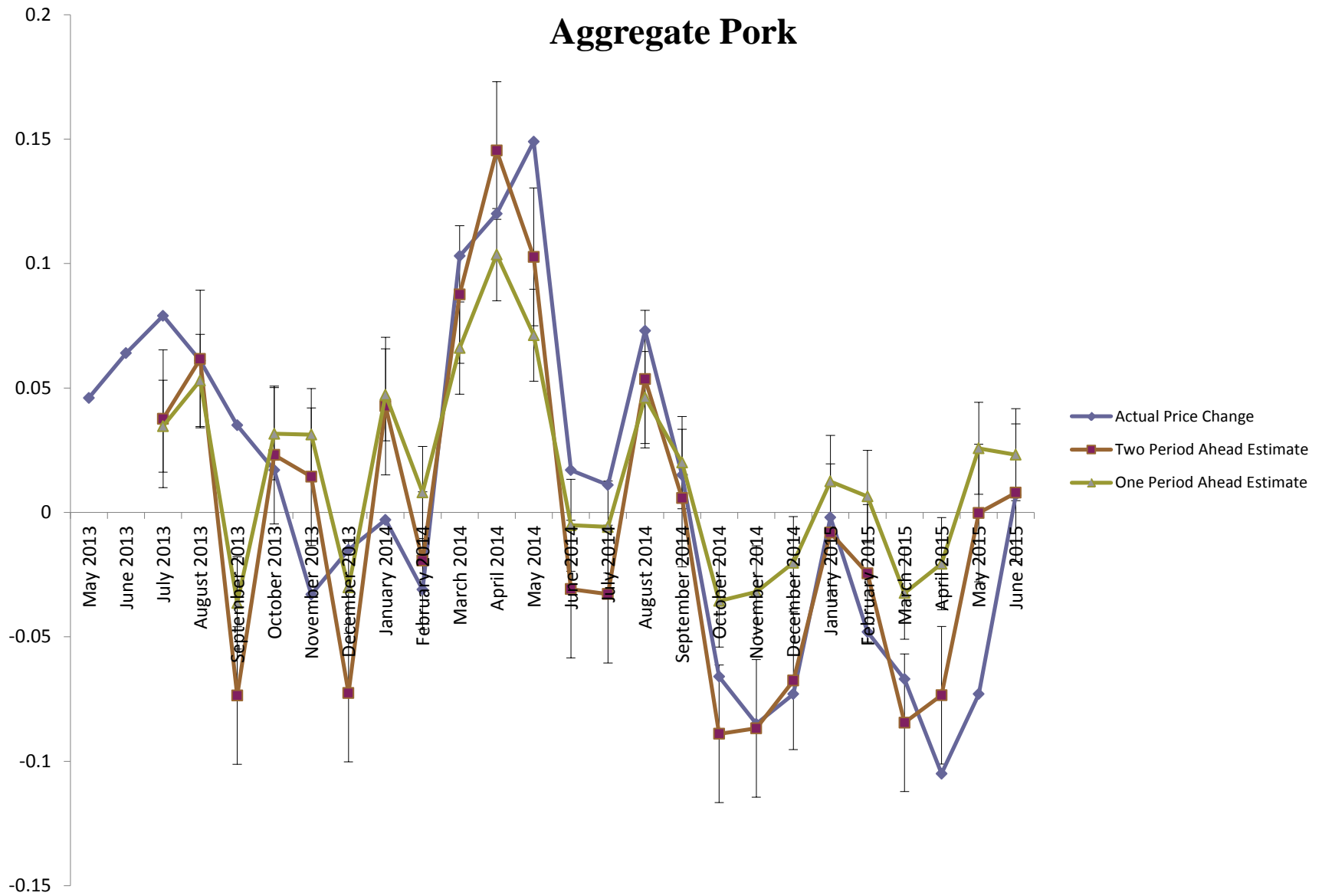
Figure 8. Aggregate Pork Retail Price Changes, Initial and Updated Price Change Estimates
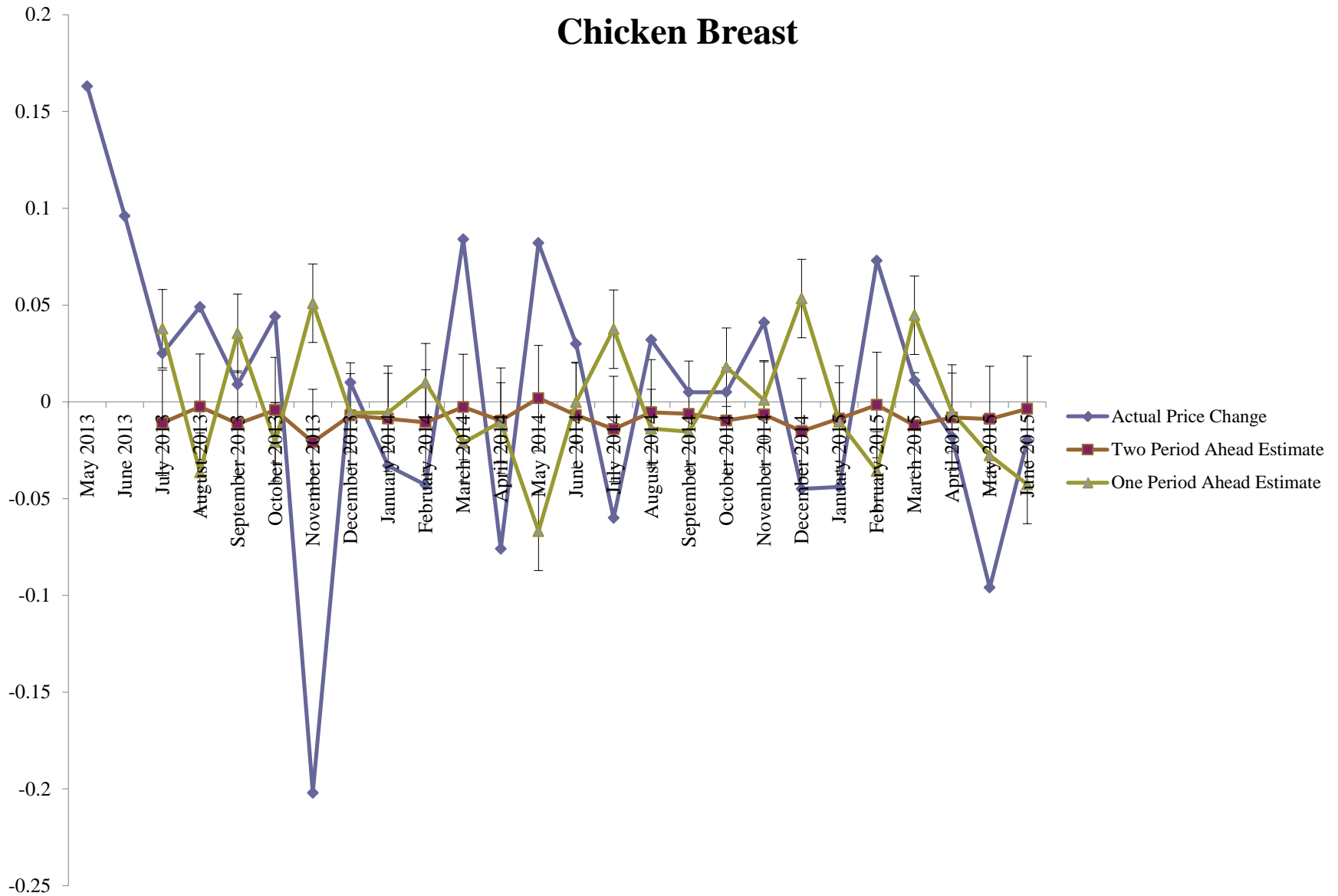
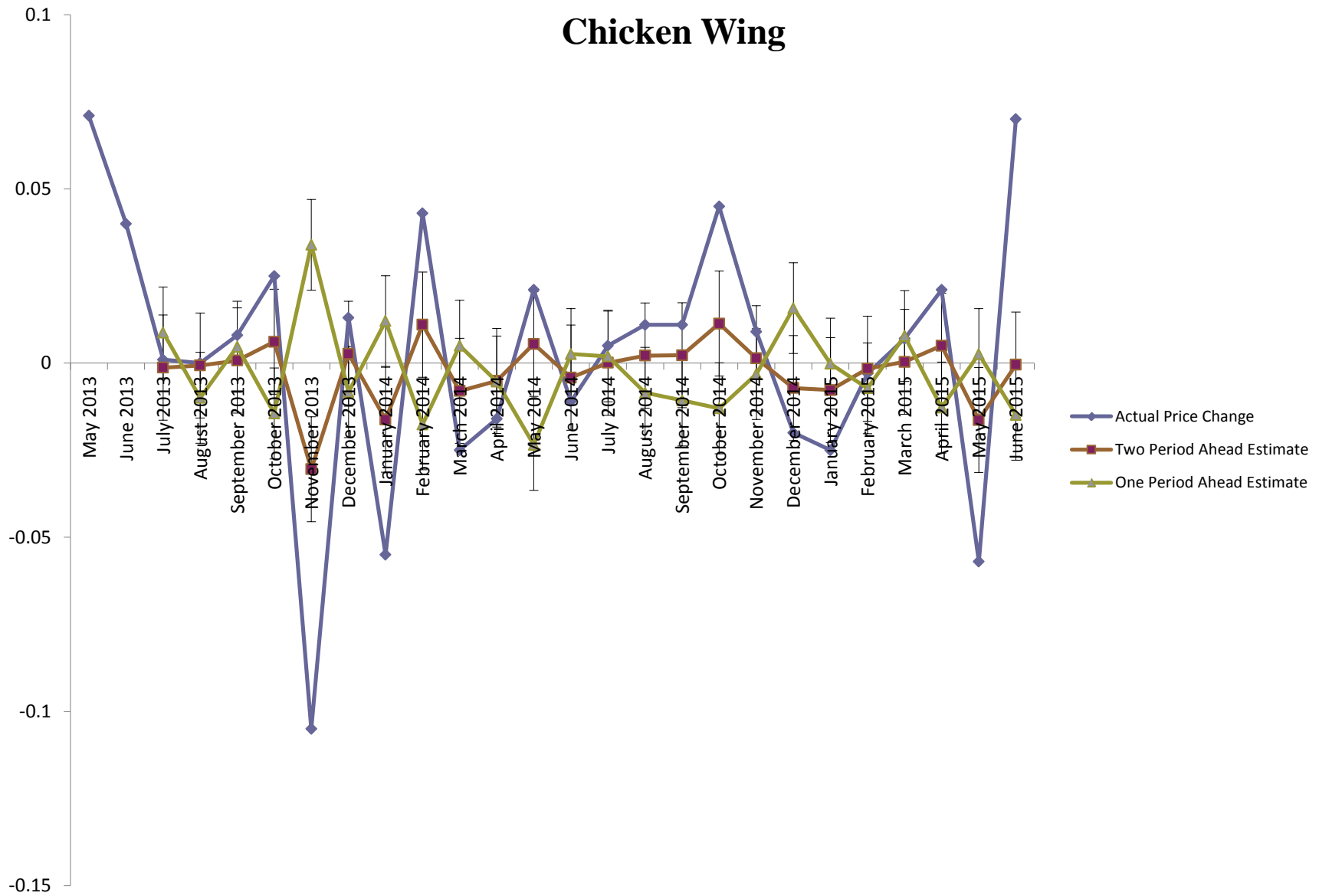**Figure 9.** Chicken Breast Retail Price Changes, Initial and Updated Price Change Estimates

Figure 10. Chicken Wing Retail Price Changes, Initial and Updated Price Change Estimates
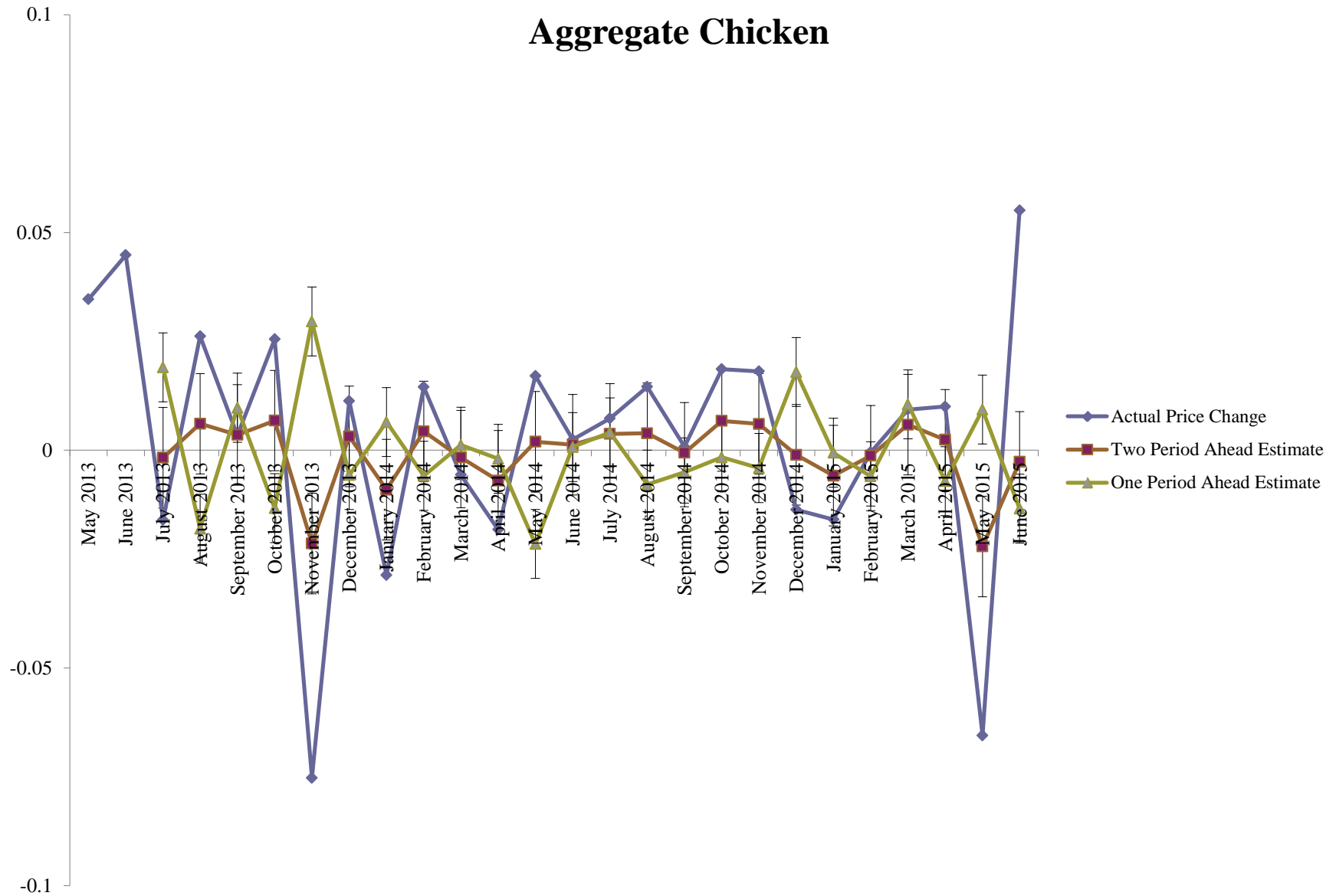
Figure 11. Aggregate Chicken Retail Price Changes, Initial and Updated Price Change Estimates

Appendix
Model Estimates in Levels

Table A1. Two Periods Ahead Forecast Models in Levels

Variables	Beef Steak	Ground Beef	Aggregate Beef	Pork Chop	Deli Ham	Aggregate Pork	Chicken Breast	Chicken Wing	Aggregate Chicken
Constant	-0.05	0.27	0.50*	1.37***	1.41**	1.50***	3.05***	0.71*	1.22**
	(0.37)	(0.19)	(0.29)	(0.26)	(0.54)	(0.29)	(0.83)	(0.37)	(0.43)
$\Delta BLSPrice_{t-2}$	0.96***	0.91***	0.87***	0.55***	0.60***	3.03***	0.14	0.55**	0.39*
	(0.06)	(0.05)	(0.05)	(0.07)	(0.13)	(0.46)	(0.23)	(0.22)	(0.22)
PE	2.01***	0.96**	1.80***	3.23***	2.27***	0.52***	-0.65	-0.02	-0.11
	(0.66)	(0.38)	0.54	(0.53)	(0.72)	(0.08)	(0.48)	(0.29)	(0.18)
Diagnostic Statistics									
MSE	0.02	0.006	0.01	0.006	0.01	0.005	0.004	0.001	0.0006

Note: Standard errors are in parenthesis. One asterisk (*) represents significance at the 90% confidence level, two asterisks at the 95% confidence level, and three asterisks at the 99% confidence level.

Table A2. One Period Ahead Forecast Models in Levels

Variables	Beef Steak	Ground Beef	Aggregate Beef	Pork Chop	Deli Ham	Aggregate Pork	Chicken Breast	Chicken Wing	Aggregate Chicken
Constant	-0.003	0.11	0.22	0.58**	0.77*	0.62***	2.46***	0.89**	1.43***
	(0.27)	(0.13)	(0.21)	(0.25)	(0.43)	(0.22)	(0.67)	(0.32)	(0.37)
$\Delta BLSPrice_{t-1}$	0.98***	0.96***	0.93***	0.79***	0.79***	0.79***	0.32	0.47**	0.30
	(0.04)	(0.03)	(0.04)	(0.07)	(0.10)	(0.06)	(0.19)	(0.19)	(0.19)
PE	1.02**	0.42	1.02**	1.85***	0.90	1.49***	-0.89**	-0.46*	-0.41**
	(0.48)	0.26	(0.39)	(0.53)	(0.58)	(0.34)	(0.39)	(0.25)	(0.15)
Diagnostic Statistics									
MSE	0.009	0.003	0.006	0.005	0.008	0.002	0.003	0.001	0.0004

Note: Standard errors are in parenthesis. One asterisk (*) represents significance at the 90% confidence level, two asterisks at the 95% confidence level, and three asterisks at the 99% confidence level.