The Financial Performance of U.S. Sugar Consumer Agribusinesses

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U.S. Sugar Policy

- As early as 1789 there was a tariff on foreign sugar imports in the U.S.
- Current U.S sugar policy under the Agricultural Act of 2014 includes (American Sugar Alliance, n.d.)
    1. Price supports (Non-Recourse Loans)
    2. Tariff-rate quotas (TRQs)
    3. Overall allotment quantity (OAQ)
- U.S. raw and wholesale refined sugar beet prices are higher than the world prices
- Sugar-using manufacturers (e.g., Hershey Co. and PepsiCo Inc.) argue that higher domestic sugar prices negatively affect their financial performance (Triantis, 2016)

U.S. Sugar Policy

Figure 1. Average Fiscal U.S. and World Raw Sugar Prices
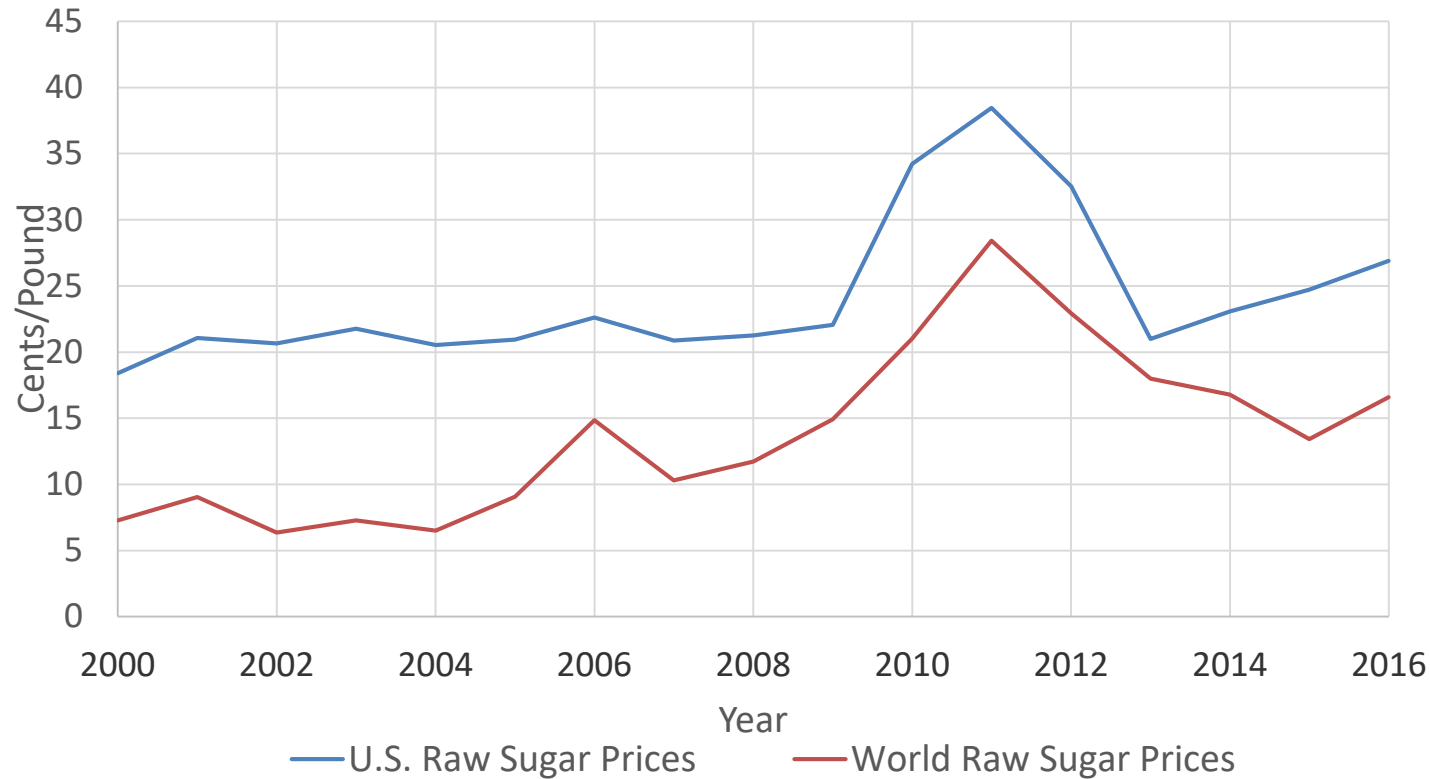
Source: United States Department of Agriculture, Economic Research Service, using data from the Sugar and Sweeteners Yearbook Tables 3b and 4

Figure 2. Average Fiscal U.S. Wholesale Refined Beet and World Refined Sugar Prices
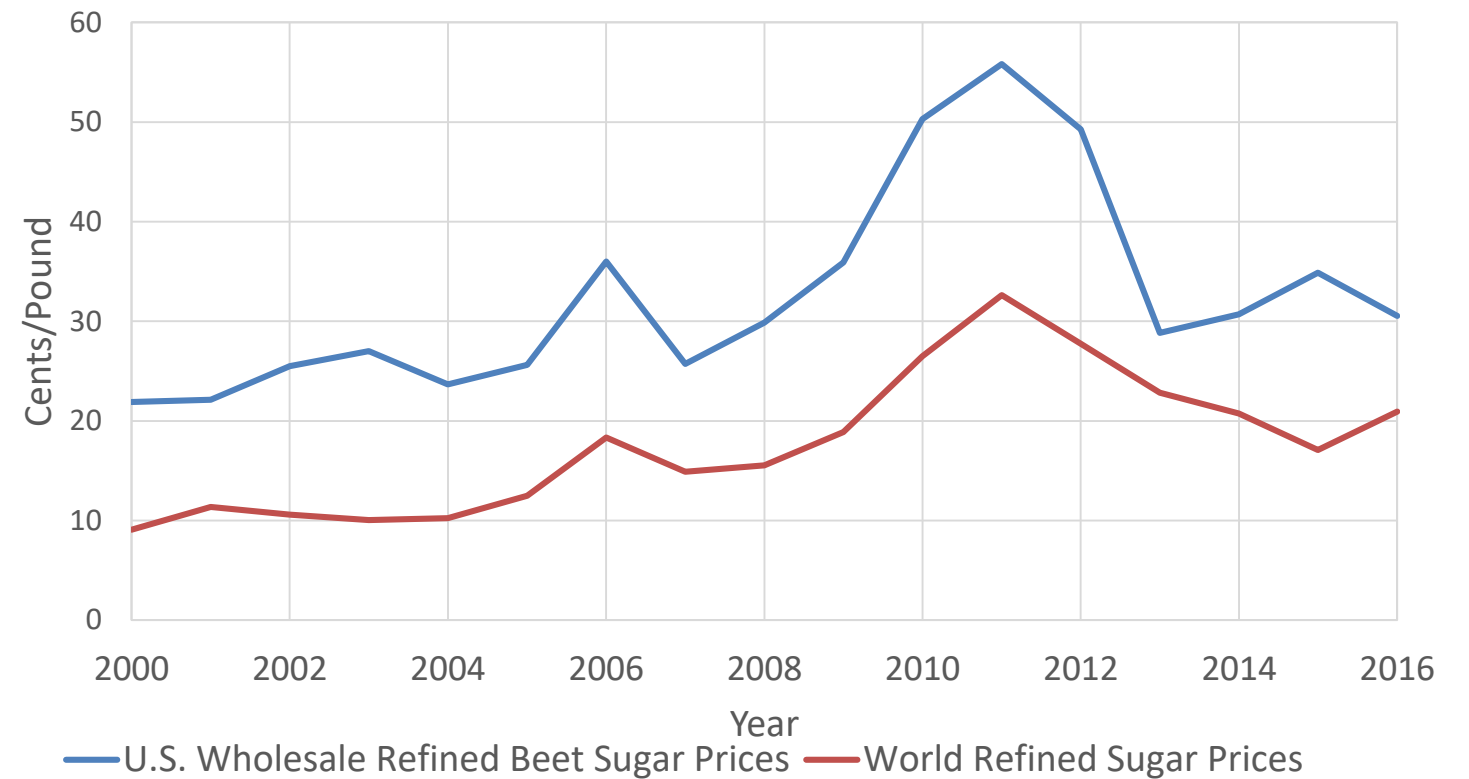
Source: United States Department of Agriculture, Economic Research Service, using data from the Sugar and Sweeteners Yearbook Tables 2 and 5

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Objectives

1. Determine if U.S. sugar policy negatively affects the performance of sugar-using agribusinesses as sugar users suggest by examining the relationship between U.S. raw and wholesale refined beet sugar prices and the financial performance of publicly-traded sugar-using manufacturers for the period 2000-2016

2. Examine the financial performance of the U.S. sugar consumer agribusinesses by applying financial ratio analysis and compare to the market (financial analysis not discussed in this presentation)

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Literature Review

- Industry reports (Triantis, 2016) have found that sugar prices do not affect sugar-using firms' financial performance.

- Financial ratio analysis is frequently used to examine corporate performance. (Osteryoung, Constand and Nast, 1992; Katchova and Enlow, 2013)

- Previous studies widely used return on assets (ROA) and return on equity (DuPont model) as proxies for firm profitability
  - Profitability (ROA) was positively affected by firm size (Ln of Sales), sales growth and investment and negatively affected by leverage and current assets (Asimakopoulos, Samitas and Papadogonas, 2009)
  - Firm size (Ln of T.A.) and industry concentration are drivers of profitability, whereas firm risk, age and industry growth, have a negative influence (Hirsch et.al, 2014)
  - Operating profits, wage bills, non-performing assets and net interest margin affect profitability, while priority sector lending does not (Seenaiah, Rath and Samantaraya, 2015)

Data

- Initial sample included all potential sugar-using agribusinesses as identified by Triantis (2016) along with companies that belong to the food and beverage industry (2017 NAICS codes 311, 31142, 3121, 31211 and 312111)

- Information from annual reports (10-k document) and the IBIS World database used to identify actual sugar-using manufacturers

  - Actual sugar-users defined as those companies that report in the 10-K document the use of sugar as main input under the "Raw Material" section

- The initial sample consisted of 204 agribusinesses. After a thorough selection process the final sample consists of 25 agribusinesses

- Quarterly accounting and stock market data gathered from COMPUSTAT and CRSP for key financial ratios

Data: Final Sample of Agribusinesses

- Campbell Soup Co.
- Coca-Cola Co.
- ConAgra Brands Inc.
- Flowers Foods Inc.
- General Mills Inc.
- Kraft Heinz Co.
- Hershey Co.
- Kellogg Co.
- Snyder's-Lance Inc.
- PepsiCo Inc.
- Smucker (JM) Co.
- Tasty Baking Co.
- Tootsie Roll Industries Inc.
- Wrigley (WM) JR Co.
- Rocky Mountain Chocolate Factory Inc.
- J&J Snack Foods Corp.
- PepsiAmericas Inc.
- Monster Beverage Corp.
- Hain Celestial Group Inc.
- Ralcorp Holdings Inc.
- Dean Foods Co.
- Mondelez International Inc.
- B&G Foods Inc.
- Post Holdings Inc.
- Dr. Pepper Snapple Group Inc.

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Methods

- We estimated the impact of these variables on the profitability (ROA) of sugar-using manufacturers

- Two different types of panel data models estimated

  - Baseline model with COGS margin and

  - Alternative model with sugar prices as a substitute of COGS margin to test whether sugar prices' variability affects profitability

- Presence of unobserved fixed-effects (unobserved heterogeneity), such as firms manager's skills and experience, suggests the use of fixed-effects model (FEM) (Wooldridge, 2012). We also applied the finite distributed lag model (FDL) because sugar prices, may have recurring impacts on profitability into the following quarters (Wooldridge, 2012)

- Hausman specification test used to verify the use of FEM

- We corrected for first order autocorrelation and heteroskedasticity

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Methods: Description of Analysis Variables

$ROA_{i,t}$ = Return on assets of firm i in quarter t

$CM_{i,t}$ = COGS margin, last twelve months (LTM) cost of goods sold divided by LTM total revenue of firm i in quarter t

$SIZE_{i,t}$ = Log_{10} of total assets of firm i in quarter t

$IS_{i,t}$ = Interest margin, last twelve months (LTM) interest paid divided by LTM total revenue for firm i in quarter t

$SALES_{i,t}$ = Percentage change in total sales over time (quarter) for firm i in quarter t

$MB_{i,t}$ = Market-to-book value for firm i in quarter t

$RAW_{i,t}$ = U.S. raw sugar prices for firm i in quarter t

$REFINED_{i,t}$ = U.S. wholesale refined sugar beet prices for firm i in quarter t

$LPPETA_{i,t-1}$ = First order lag value of property plant and equipment to total assets ratio for firm i in quarter t

$LCATA_{i,t-1}$ = First order lag value of current assets to total assets ratio for firm i in quarter t

$LRAW_{i,t-j}$ = Lag value of order j (with j= 1..4) of U.S. raw sugar prices for firm i in quarter t

$LREFINED_{i,t-j}$ = Lag value of order j (with j= 1..4) of U.S. wholesale refined sugar beet prices for firm i in quarter t

$FQ_{j,t}$ = Fiscal quarter dummy variable (with j= 2..4) for quarter t

a_i = Unobserved firm-specific effects

$e_{i,t}$ = Error term

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Methods

- FEM models:

$$ROA_{i,t} = \beta_0 + \beta_1 \cdot SIZE_{i,t} + \beta_2 \cdot IS_{i,t} + \beta_3 \cdot SALES_{i,t} + \beta_4 \cdot MB_{i,t} + \beta_5 \cdot CM_{i,t} + \beta_6 \cdot LPPETA_{i,t-1} + \beta_7 \cdot LCATA_{i,t-1} + \beta_8 \cdot FQ_{2,t} + \beta_9 \cdot FQ_{3,t} + \beta_{10} \cdot FQ_{4,t} + a_i + e_{i,t} \quad (1)$$

$$ROA_{i,t} = \beta_0 + \beta_1 \cdot SIZE_{i,t} + \beta_2 \cdot IS_{i,t} + \beta_3 \cdot SALES_{i,t} + \beta_4 \cdot MB_{i,t} + \beta_5 \cdot RAW_{i,t} + \beta_6 \cdot LPPETA_{i,t-1} + \beta_7 \cdot LCATA_{i,t-1} + \beta_8 \cdot FQ_{2,t} + \beta_9 \cdot FQ_{3,t} + \beta_{10} \cdot FQ_{4,t} + a_i + e_{i,t} \quad (2)$$

$$ROA_{i,t} = \beta_0 + \beta_1 \cdot SIZE_{i,t} + \beta_2 \cdot IS_{i,t} + \beta_3 \cdot SALES_{i,t} + \beta_4 \cdot MB_{i,t} + \beta_5 \cdot REFINED_{i,t} + \beta_6 \cdot LPPETA_{i,t-1} + \beta_7 \cdot LCATA_{i,t-1} + \beta_8 \cdot FQ_{2,t} + \beta_9 \cdot FQ_{3,t} + \beta_{10} \cdot FQ_{4,t} + a_i + e_{i,t} \quad (3)$$

- FDL model (estimated with a lag of 4 quarters for U.S. raw and wholesale refined sugar prices).

$$ROA_{i,t} = \beta_0 + \beta_1 \cdot SIZE_{i,t} + \beta_2 \cdot IS_{i,t} + \beta_3 \cdot SALES_{i,t} + \beta_4 \cdot MB_{i,t} + \beta_5 \cdot RAW_{i,t} + \beta_6 \cdot LRAW_{i,t-1} + \beta_7 \cdot LRAW_{i,t-2} + \beta_8 \cdot LRAW_{i,t-3} + \beta_9 \cdot LRAW_{i,t-4} + \beta_{10} \cdot LPPETA_{i,t-1} + \beta_{11} \cdot LCATA_{i,t-1} + \beta_{12} \cdot FQ_{2,t} + \beta_{13} \cdot FQ_{3,t} + \beta_{14} \cdot FQ_{4,t} + a_i + e_{i,t} \quad (1)$$

$$ROA_{i,t} = \beta_0 + \beta_1 \cdot SIZE_{i,t} + \beta_2 \cdot IS_{i,t} + \beta_3 \cdot SALES_{i,t} + \beta_4 \cdot MB_{i,t} + \beta_5 \cdot REFINED_{i,t} + \beta_6 \cdot LREFINED_{i,t-1} + \beta_7 \cdot LREFINED_{i,t-2} + \beta_8 \cdot LREFINED_{i,t-3} + \beta_9 \cdot LREFINED_{i,t-4} + \beta_{10} \cdot LPPETA_{i,t-1} + \beta_{11} \cdot LCATA_{i,t-1} + \beta_{12} \cdot FQ_{2,t} + \beta_{13} \cdot FQ_{3,t} + \beta_{14} \cdot FQ_{4,t} + a_i + e_{i,t} \quad (2)$$

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Table 1. Summary Statistics							
Variables	**Symbol**	**Number of Observations**	**Mean**	**Std. Dev.**	**Variance**	**Max**	**Min**
Return on assets	ROA	1,397	0.0765	0.0632	0.0040	0.3680	-0.2973
U.S. raw sugar prices (¢/lb)	RAW	1,397	24.5672	5.7323	32.8593	40.1600	17.6400
U.S. wholesale refined sugar beet prices (¢/lb)	REFINED	1,397	33.2603	10.4851	109.9366	59.5000	19.0000
Market-to-book value	MB	1,397	2.3271	1.3973	1.9525	16.4767	0.1242
COGS margin	CM	1,397	0.5832	0.1207	0.0146	0.9863	0.2702
Interest expenses to sales	IS	1,397	0.0168	0.0181	0.0003	0.1222	0.0000
Current assets to total assets	CATA	1,397	0.3035	0.1376	0.0189	0.9132	0.0552
PPE to total assets	PPETA	1,397	0.2540	0.1273	0.0162	0.7127	0.1491
Log_{10} of total assets	SIZE	1,397	3.4996	0.8465	0.7166	5.0909	1.1773
Sales growth (%)	SALES	1,397	1.6305	4.0492	16.3961	35.5079	-15.4183

Results: Baseline Model

Table 2. FEM Results for the Baseline Model

Variable	FEM with time dummies		
	Coefficient	Standard Error	t-value
Market-to-book value	0.0144***	0.0043	3.38
Interest expenses to sales	-1.0205***	0.3601	-2.83
Log_{10} of total assets	-0.0406*	0.0209	-1.94
COGS margin	-0.0988*	0.0522	-1.89
Sales growth	0.0006	0.0006	1.04
First order lag value of PPE to total assets	-0.1184*	0.0619	-1.91
First order lag value of current assets to total assets	0.0710**	0.0308	2.30
Constant	0.2685**	0.1095	2.45
Fiscal Quarter			
2	-0.0013	0.0009	-1.42
3	-0.0009	0.0010	-0.85
4	-0.0009	0.0007	-1.28
σ_u	0.0381		
σ_e	0.0343		
ρ	0.5527		
R^2 (Overall)	0.4036		
Hausman test	$X^2(10) = 25.10$ Prob. = 0.0052		
F-test for time effect	F (3, 24) = 1.98 Prob = 0.1432		

Note. ***,**,* indicate significance at the 1%, 5%, and 10% level. The standard errors are robust for heteroskedasticity and autocorrelation

Results: Baseline Model

- The overall performance of the baseline model is satisfactory with a 40% of profitability can be explained by the control factors

- All the variables, except sales growth, impact profitability.

- COGS margin negatively affects firms' profitability

- Firms' expectations (MB) and lagged investment decisions (LCATA) have a significant and positive effect on profitability

- To test whether sugar prices' variability affects profitability, sugar prices must have a significant and negative impact on ROA

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Results: FEM with U.S. Raw Sugar Prices

Table 3. FEM Results for the Model Using U.S. Raw Sugar Prices

Variable	FEM with time dummies		
	Coefficient	Standard Error	t-value
U.S. raw sugar prices	-0.0003	0.0006	-0.56
Market-to-book value	0.0148***	0.0045	3.27
Interest expenses to sales	-0.9939***	0.3509	-2.83
Log_{10} of total assets	-0.0388*	0.0196	-1.98
Sales growth	0.0006	0.0006	1.07
First order lag value of PPE to total assets	-0.1051*	0.0588	-1.79
First order lag value of current assets to total assets	0.0625*	0.0352	1.77
Constant	0.2099**	0.0946	2.22
Fiscal Quarter			
2	-0.0013	0.0009	-1.45
3	-0.0007	0.0010	-0.67
4	-0.0008	0.0007	-1.14
σ_u	0.0421		
σ_e	0.0345		
ρ	0.5983		
R^2 (Overall)	0.3215		
Hausman test	$X^2(10) = 13.05$ Prob. = 0.2210		
F-test for time effect	F (3, 24) = 2.05 Prob = 0.1334		

Note. ***,**,* indicate significance at the 1%, 5%, and 10% level. The standard errors are robust for heteroskedasticity and autocorrelation

Results: FEM with U.S. Wholesale Refined Sugar Beet Prices

Table 4. FEM Results for the Model Using U.S. Wholesale Refined Sugar Beet Prices			
	FEM with time dummies		
Variable	**Coefficient**	**Standard Error**	**t-value**
U.S. wholesale refined sugar beet prices	-0.0001	0.0003	-0.20
Market-to-book value	0.0150***	0.0046	3.23
Interest expenses to sales	-0.9842***	0.3545	-2.78
Log_{10} of total assets	-0.0408**	0.0195	-2.09
Sales growth	0.0006	0.0006	1.08
First order lag value of PPE to total assets	-0.1058*	0.0610	-1.74
First order lag value of current assets to total assets	0.0602	0.0359	1.67
Constant	0.2118**	0.0949	2.23
Fiscal Quarter			
2	-0.0012	0.0009	-1.38
3	-0.0007	0.0011	-0.69
4	-0.0008	0.0007	-1.08
σ_u	0.0432		
σ_e	0.0345		
ρ	0.6103		
R^2 (Overall)	0.3102		
Hausman test	$X^2(10) = 21.78$ Prob. = 0.0163		
F-test for time effect	F (3, 24) = 1.77 Prob = 0.1794		
Note. ***,**,* indicate significance at the 1%, 5%, and 10% level. The standard errors are robust for heteroskedasticity and autocorrelation			

Results: Overall Performance of FEM Models

- Both FEM models (U.S. raw and wholesale refined sugar beet prices) have an overall performance above 30%

- U.S. sugar prices have a negative but not significant impact. Hence, both sugar prices are not considered as a substitute of COGS

- Variability in U.S. raw and refined sugar prices does not appear to affect sugar consumers' profitability

- The impact of control factors on profitability is consistent in both models

- Consistently, percentage growth in firm's revenues does not have any significant impact on ROA

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Results: FDL Model with U.S. Raw Sugar Prices

Variable	Coefficient	Standard Error	t-value
Table 5. Results Applying the FDL Model for U.S. Raw Sugar Prices			
U.S. raw sugar prices	0.0004	0.0003	1.25
First order lag of U.S. raw sugar prices	-0.0001	0.0003	-0.37
Second order lag of U.S. raw sugar prices	-0.0002	0.0003	-0.57
Third order lag of U.S. raw sugar prices	-0.0003	0.0003	-0.92
Fourth order lag of U.S. raw sugar prices	-0.0004	0.0004	-0.96
Market-to-book value	0.0169***	0.0046	3.65
Interest expenses to sales	-1.0509***	0.3776	-2.78
Log_{10} of total assets	-0.0450**	0.0202	-2.22
Sales growth	0.0005	0.0006	0.84
First order lag value of PPE to total assets	-0.1265**	0.0553	-2.29
First order lag value of current assets to total assets	0.0548	0.0386	1.42
Constant	0.2418**	0.0931	2.60
Fiscal Quarter			
2	-0.0001	0.0007	-0.17
3	-0.0002	0.0009	-0.20
4	-0.0008	0.0006	-1.30
σ_u	0.0452		
σ_e	0.0338		
ρ	0.6411		
R^2 (Overall)	0.2903		

Note. ***,**,* indicate significance at the 1%, 5%, and 10% level. The standard errors are robust for heteroskedasticity and autocorrelation. F-test for time effects conducted and no significance indicated.

Results: FDL Model with U.S. Wholesale Refined Sugar Beet Prices

Table 6. Results Applying the FDL Model for U.S. Wholesale Refined Sugar Beet Prices			
Variable	Coefficient	Standard Error	t-value
U.S. wholesale refined sugar beet prices	0.0007***	0.0002	3.43
First order lag of U.S. wholesale refined sugar beet prices	-0.0004	0.0003	-1.47
Second order lag of U.S. wholesale refined sugar beet prices	-0.0004**	0.0002	-2.18
Third order lag of U.S. wholesale refined sugar beet prices	-0.0001	0.0001	-0.69
Fourth order lag of U.S. wholesale refined sugar beet prices	0.0000	0.0003	0.16
Market-to-book value	0.0173***	0.0047	3.65
Interest expenses to sales	-1.0314**	0.3765	-2.74
Log_{10} of total assets	-0.0472**	0.0201	-2.34
Sales growth	0.0005	0.0006	0.76
First order lag value of PPE to total assets	-0.1277**	0.0567	-2.25
First order lag value of current assets to total assets	0.0506	0.0397	1.27
Constant	0.2398**	0.0933	2.57
Fiscal Quarter			
2	-0.0004	0.0008	-0.45
3	-0.0010	0.0010	-0.89
4	-0.0008	0.0006	-1.30
σ_u	0.0463		
σ_e	0.0338		
ρ	0.6519		
R^2 (Overall)	0.2820		
Note. ***,**,* indicate significance at the 1%, 5%, and 10% level. The standard errors are robust for heteroskedasticity and autocorrelation. F-test for time effects conducted and no significance indicated.			

Conclusions

- U.S. raw and wholesale refined sugar beet prices consistently are not significant almost in every model. They are significant only in the FDL model with U.S. wholesale refined sugar beet prices

- Firm's prospect (MB), size, leverage (IS) and lagged investment decisions (LPPETA) consistently have a significant impact on profitability. Only firm's prospect has a positive impact on ROA

- Sales growth does not affect profitability (in every model)

- Some evidence that lagged wholesale refined sugar beet prices negatively affect firm profitability. The long-run multiplier (LRP) is -0.0002 by adding the beta coefficients of the contemporaneous and lagged wholesale refined sugar beet prices variables

Conclusions

- U.S. sugar prices do not seem to have a major and significant impact on profitability of sugar-using manufacturers, consistent with Triantis (2016)

- Sugar seems to be small part of COGS for the selected U.S. sugar-using manufacturers

- These findings may contribute to ongoing debate regarding the economic effects of the U.S. sugar program on the performance of sugar-using agribusinesses

THANK YOU

QUESTIONS AND SUGGESTIONS

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