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Relationship of Grain Stocks and Marketing Behavior

by

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Relationship of Grain Stocks and Marketing Behavior

Farmers, merchandisers and end-users are faced with the challenge of allocating stocks of grains and oilseeds throughout the marketing year. Farmers want to obtain the best price subject to storage costs and storage constraints. Merchandisers want to assemble crops, provide storage services and supply end-users with steady quantities. Storage is available and reported at the farm level and across off-farm locations. Percentages marketed by farmers are also reported, but not until the end of the marketing year. Thus, there is information about the physical location of crops and its ownership by farmers. Factors are examined that explain the storage and marketing behavior of farmers and by the entire supply chain. Price expectations are examined, but are dominated by strong seasonal patterns in disappearance and marketings. A disparity between on-farm and off-farm disappearance is identified, the latter being intractable to quantify. A disparity between marketings and on-farm disappearance suggests a large portion of off-farm stocks are owned by farmers, potentially creating storage constraints at off-farm locations.

Keywords: farmer marketings, quarterly stocks, storage, basis, carry

Introduction

Annual production of grains and oilseeds – namely, corn, soybeans, and wheat – has risen steadily in recent years. The larger production has, at times, outpaced the ability to smoothly handle and store crops, such as occurred in late 2013 (Agricultural Marketing Service, 2015) in South Dakota and other corn-belt states. With a better understanding of producer marketing behavior, it may be possible to better explain and forecast stocks levels and prices.

Stocks levels are reported quarterly at both on-farm and off-farm locations at the state level. A model is proposed to examine the change in quarterly stocks as a function of farmer marketing levels. The investigation begins with a review of when, how, and why stocks move from on-farm to off-farm storage, and of the level of on-farm disappearance that can be attributed to on-farm consumption. There are major trends in quarterly usage, controlling for differences in price and production.

Monthly National Agricultural Statistics Service (NASS) marketing levels of corn, soybeans, and wheat are aggregated to quarterly totals and used to explain changes in stocks levels or in disappearance. As such, production is accounted for during harvest quarters. Marketing levels are expected to be a function of basis, carry and the remaining stocks at the beginning of a quarter. Basis will be estimated using the difference between the cash price (just observed) for the commodity at the state level and the nearby futures price measured at the beginning of the quarter. Carry will be measured using a difference in a deferred and a nearby futures price measured at the beginning of the quarter.

In addition to greater understanding of the relationship between marketing levels and quarterly stocks, the method allows for insights into the location of stocks. A lingering concern by various market participants has been the presence of farmer-owned grain in off-farm storage locations. Any divergence of marketing levels and disappearance may explain disparities between on-farm and off-farm stocks levels. Improved forecasts of quarterly grain stocks, based on variables in the model, may also lead to better price forecasts.

Understanding, to a higher degree, the expected effect that each determinant will have on usage – and the resulting stocks of each commodity – may help market participants plan for the future and may reduce stressors on market infrastructure during years of high production. These results will help producers, merchandisers, and end-users better manage stocks at any given point in time. The analysis will help explain the timing of sales and transportation needs and will increase understanding of the regional supply system.

Literature

There is a commonly accepted relationship between stocks and prices, where higher stocks levels are associated with lower prices. Using a quarterly model for corn, Westcott, Hull, and Green (1985) discuss the relationship between prices and stocks. Stocks are used to explain prices. Lowry et al. (1987) consider how storage allocates annual inventories, both within and between crop years. When market conditions change, producers may choose to add additional on-farm storage. The Australian domestic wheat market, for example, was deregulated in 1989, authorizing expansion of on-farm storage to existing state-managed storage capacity. Hunter, Hooper, and Moon (1992) describe this development of on-farm capacity as investment and the role that storage plays in grain allocation.

Forward contracts predominately call for delivery at harvest. Thus, marketing and delivery would occur during the harvest quarter. There are some forward contracts that give a post-harvest delivery date, for example, a contract against March corn. Such contracts would also imply a consistent marketing and delivery date. Farmers delivering and storing grain at an elevator at harvest would be an obvious exception. Delivery would be made to an elevator, but the change in ownership (or marketing) would not occur. The farmer would pay for storage and then market the grain when the price induced a sale. One final type of behavior, with uncertain effects on this system, would be the use of delayed pricing contracts. Such contracts have become prevalent and routinely cover a large number of bushels at harvest in the Northern Plains. How they are perceived by farmers and by NASS is unclear. Baldwin, Thraen, and Larson (1987) develop a model to gauge the impact of delayed price contracts on basis and marketing efficiency.

Several studies investigate state-level marketing patterns. Anderson and Brorsen (2005) use a weighting of sales to elevators and show that Oklahoma producers are marketing efficiently when considering the prices received throughout the post-harvest period. Cunningham, Brorsen and Anderson (2007) discuss several aspects of marketing behavior that may explain multiple sale or marketing dates for producers, such as cash flow needs and tax management considerations. The number of times does not have a strong relation to the price received over time. Dietz, et al. (2009) was the latest study where weighted marketings were used to determine the benchmark price in an evaluation of marketing strategies.

MacDonald and Korb (2011) report marketing trends in recent decades. The use of marketing and production contracts have become increasingly popular, covering 26.1 percent of the value of all corn production in the U.S., 25.1 percent of soybean production, and 22.5 percent of wheat production in 2008. Contracts are used to manage price risks, along with futures hedges, option hedges, on-farm storage and producer cooperatives. The report notes that as of 2008, relatively small shares of corn, wheat, and soybean production are produced on farms that market exclusively in cash markets, but the absolute number of farms in that category remains high.

Several studies have assessed the use of various market signals to determine how producers actually make decisions to market or to store. Fackler and Livingston (2002) applied a simplifiying all-or-nothing approach to model when a producer either markets an entire inventory or stores it. Additionally, the irreversibility concept employed by Fackler and Livinston enables a simplifying account of how grain passes through on-farm and off-farm storage. Lai, Myers, and Hanson (2003) construct a compelling model where risk-averse farmers spread out sales throughout the crop year, noting that an all-or-nothing assumption is inconsistent with empirical analysis. Kastens and Dhuyvetter (1999) employ empirical analysis of the effectiveness of various grain storage strategies, particularly the use of hedging with deferred futures. Comparing similar market metrics, Siaplay et al. (2012) determine basis to be the strongest signal to a profit-maximizing producer during the post-harvest period.

Data

NASS conducts state-specific surveys according to the specific commodities produced in each area. Monthly data compiled from producers include prices received for crops and quantities sold. NASS also surveys elevators and buyers to obtain total quantity purchased and total dollars received. Surveys are conducted in every state, although not all states survey every crop. The data are aggregated and published in the *Agricultural Prices* report on or near the last business day of each month. Marketings and monthly cash price data for this research are derived from this survey and were collected from the NASS searchable database QuickStats. NASS maintains average monthly prices of the major commodities from more than a century ago, but state-level marketings are a relatively recent addition to the reports, first appearing as a standard component in the late 1990s. Bulletins published by the South Dakota Department of Agriculture include marketings from the 1985-1986 marketing year to present.

The quarterly Crops/Stocks surveys conducted by NASS obtain detailed estimates of on-farm grain and oilseeds stocks, as well as crop acreage, yields, and production. Storage capacity estimates are gathered annually in the December survey. Surveyed operators provide data on the total acres available, acreage in each commodity of interest and amount produced at harvest. The off-farm figures are obtained through a quarterly enumeration of all identified commercial grain storage facilities. Responses include total stocks of grain and oilseeds stored, itemized by commodity. Surveys are unique to each state, based on prevalent agricultural production. Grain stocks data for this research are derived from this survey, and were collected from QuickStats. NASS maintains on-farm and off-farm stocks, nationally from the 1920s, and at the state level beginning in the 1940s. Because state-level marketings data are unavailable before 1985, only data from that point forward are used for this study.

The 2014 corn crop production and stocks data for South Dakota are shown in Figure 1. Total production was estimated at 787 million bushels. By December 1, 2014 the total stocks of corn for the quarter were 602 million bushels, with the on-farm total estimated at 400 million bushels. The disappearance during the harvest quarter accounts for ending stocks from the prior year. The steady pattern of declining stocks throughout the marketing year is evident.

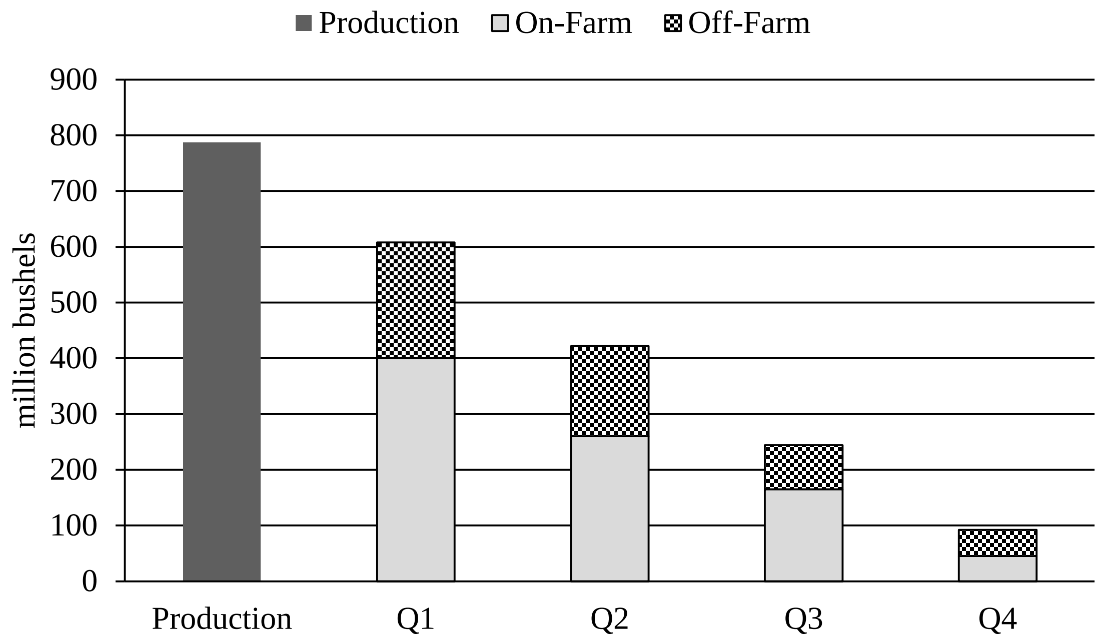

Figure 1. South Dakota Corn Production and Stocks, 2014-2015

The marketing year for corn in South Dakota switched from October through September to September through August in 2001, and marketings for September 2001 are included in both the 2001 and 2002 marketing years. Thus, corn stocks data from before 2001 overlay two crop years during the September through November period. The new marketing year for corn and the marketing year for soybeans align with the beginning of a stocks reporting period. The marketing year for wheat begins in July, which means that stocks data acquired from the June through August period are from two different marketing years.

Figure 2 shows South Dakota average monthly marketings for corn, soybeans and wheat between 2010 and 2015. The differences in marketing years across crops are evident with wheat being marketed earlier than corn and soybeans. Certain months exhibit substantial percentages sold. Significant activity occurs in months immediately following harvest, particularly for soybeans and wheat. For this research, marketings are aggregated into quarters. This likely masks explanatory differences between the months in each quarter, but stocks data are only available quarterly. Disappearance is not attributable to specific months at the state level.

Interest rate data are specific to the Ninth District of the Federal Reserve System. The quarterly agriculture operating loan interest rates were obtained from the from the Federal Reserve Bank of Kansas City, the Federal Reserve Bank of Minneapolis, and various issues of the Agricultural Finance Databook. The earliest years can be obtained using the Federal Reserve Archival System for Economic Research (FRASER).

Basis is calculated as the difference between the historical state-wide average monthly cash price reported by NASS and the monthly nearby futures price by commodity. Futures data are from the Bloomberg electronic database, where nearby refers to the futures contract with the most immediate maturity date. To facilitate a quarterly model, data from the middle month of each quarter are used. Carry is determined by the difference between a deferred and the nearby futures price.

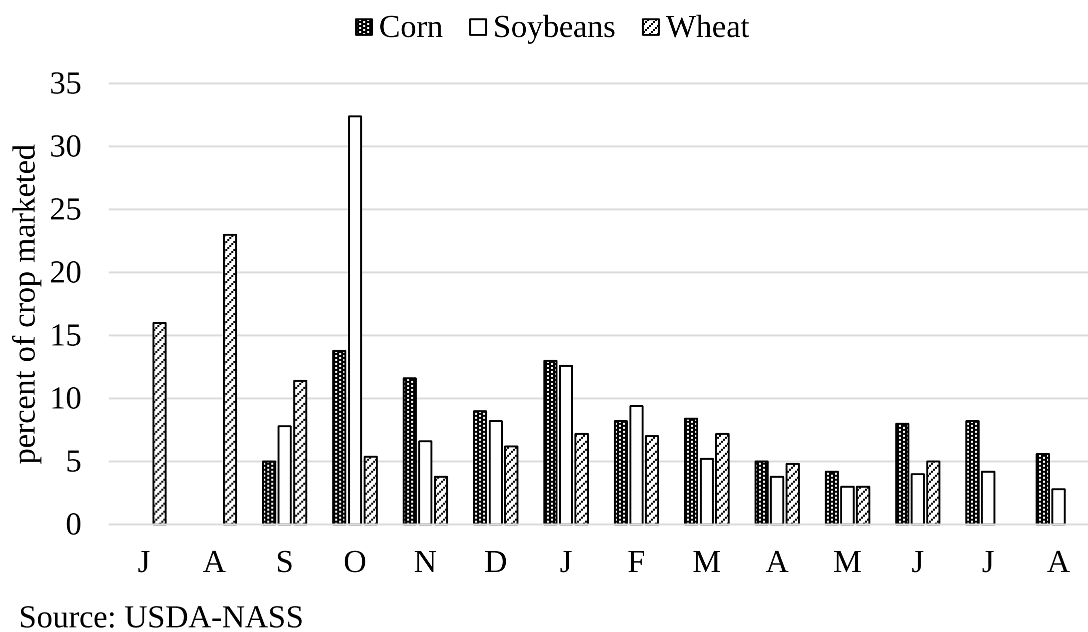

Figure 2. South Dakota Average Monthly Marketings, 2010-2015

Model

Decisions to market or to store are generally advised by expectations of future market conditions, relative to current levels. A profit-maximizing producer will choose to hold stocks if the marginal future benefit exceeds the marginal holding cost. Marketings, then, are expected to increase with a narrow basis and to decrease with a strong carry. On-farm disappearance is expected to increase with a narrow basis and a lack of carry. The marketing year for annually-produced commodities is divided into quarters, beginning the first day of December, March, June, and September. These quarters coincide with the reporting periods used by NASS for grain stocks. Farmer marketings are aggregated and expressed as the percent of annual production marketed during a given quarter.

In the current time period, a producer can either sell the crop at the spot price (S_t), or look to the futures market (F_{t+1}) and adjust the futures price by expected basis, $E(B_{t+1})$. Holding the crop until the next quarter is assumed to have an opportunity cost, assigned as a quarterly interest charge on the spot price, at rate I_t. Define the expected price difference from holding the crop as:

$$E[PD_t] = [F_{t+1} + E(B_{t+1})] - [S_t + (I_t \times S_t)].$$

Marketings (M_t) are thus modeled as a function of the expected price difference *E[PD$_t$]*, and other exogenous variables, $\boldsymbol{X}_t$:

$$M_t = f(E[PD_t], \boldsymbol{X}_t).$$

Expectations of basis are formed from historical levels. $E(B_t)$ is the three-year average basis for a given quarter, the difference between the spot price and the nearby futures price. For example, $E(B_t)$ of a given crop for the quarter extending from June through August 2015 is determined using July basis averaged from 2012-2014. S_t is the statewide average cash price during July 2015, and F_t is the nearby futures price observed on the first day of July 2015. Interest rate (I_t) is the annual percentage reported for the quarter, divided by 4 to obtain a quarterly rate. Quarterly dummy variables are expected to show the seasonal shifts from harvest, seasonal demand, and a tendency to delay sales until after January 1 for income tax management.

Grain is harvested and added to inventory during only one quarter, while inventory is used throughout all four quarters. Disappearance ($D^k{}_t$) is the measure of stocks that are depleted during a given quarter *t* from *k* locations. The disappearance models allow for differences between on-farm and total inventory levels:

$$D_t^{On-Farm} = g(E[PD_t], M_t, \boldsymbol{X}_t), \text{ and}$$

$$D_t^{Total} = h(E[PD_t], M_t, \boldsymbol{X}_t).$$

Crops are grown on farms, thus it is assumed that all inventories originate with on-farm storage, even if a commodity is transported directly from the field to an off-farm location. This assumption simplifies supply chain concepts and allows for persuasive comparisons between on-farm and total levels.

Because cumulative marketings for a given year results from a change in ownership and cumulative disappearance for a given year describes physical changes in a commodity's location, producer behavior may help to explain disparities between marketings and disappearance. On-farm disappearance in excess of marketings likely reflects the presence of farmer-owned grain in off-farm storage locations, which has complicated state and regional forecasting efforts (Agricultural Marketing Service, 2015).

To investigate the influence of expectations on marketings, OLS regression will be employed to estimate the effect. The model for each crop is formulated by the following equation:

$$M_t = \beta_0 + \beta_1 E(PD_t) + \beta_2 Q2 + \beta_3 Q3 + \beta_4 Q4 + \varepsilon_t,$$

where the exogenous variables are the expected price difference and quarterly dummy variables. Dummy variables *Q2*, *Q3*, and *Q4* provide a *ceteris paribus* comparison of marketings between each quarter and the harvest quarter. The base quarter, implied *Q1*, is the period in which a given crop is typically harvested. For wheat, this is from June through August. For corn and soybeans this is from September through November. As specified, the marketings are assumed to not be influenced by the level of on-farm stocks. Any price effect would happen through the spot price influence in the current period.

On-farm disappearance, $D_t^{On-Farm}$, is estimated as:

$$D_t^{On-Farm} = \gamma_0 + \gamma_1 M_t + \gamma_2 E(PD_t) + \gamma_4 Q2 + \gamma_5 Q3 + \gamma_6 Q4 + \varepsilon_t.$$

Similarly, total disappearance, D_t^{Total}, is estimated as:

$$D_t^{Total} = \delta_0 + \delta_1 M_t + \delta_2 E(PD_t) + \delta_4 Q2 + \delta_5 Q3 + \delta_6 Q4 + \varepsilon_t.$$

Each disappearance variable is expressed as a percentage of the year's harvest for quarter *t*. On-farm disappearance is the difference in beginning and ending on-farm stocks plus any harvested bushels. Total disappearance is defined similarly as it also accounts for any harvested bushels. M_t is the percent of the year's harvest marketed during quarter *t*. The disappearance models assume marketings for the current quarter are exogenous. Marketings would not be known nor reported, but the marketing model could be used to obtain forecasts of M_t. $E(PD_t)$ is the *ex-ante* estimated per-bushel price difference between quarters *t* and *t+1*.

The coefficients in each model reveal how the variables explain on-farm and total disappearance levels. Alternatively, carryover effects could be documented as a drawdown or build-up of ending stocks by marketing year. The presence or absence of carryover stocks during the final quarter of the marketing year is theoretically and empirically significant, but there is not a simple way to address the impact. Lowry, et al. (1987) demonstrate the conditional importance of carryover stocks. However, the data used here confine allocation to the marketing year. Marketings expressed as a percentage of production conceal overlaps between years.

There is a range of potential off-farm disappearance levels making a model intractable. A minimum disappearance level is the change in off-farm stocks for a quarter. A maximum disappearance level is the change in off-farm stocks for the quarter plus on-farm disappearance for a quarter. The minimum may also be influenced or modified if cumulative on-farm disappearance exceeds cumulative farmer marketings.

Consider the potential off-farm disappearance for the second quarter (December, January, and February) of the 2014 South Dakota corn crop. As a non-harvest quarter, the change in on-farm stocks and total stocks equal the respective disappearance levels (Table 1). No inflows would be rational except for during harvest.

Table 1. Possible Off-Farm Disappearance Levels

	On-Farm	Off-Farm Minimum	Off-Farm Maximum	Total
		Millions of bushels		
Beginning Stocks	400	208	208	608
Inflows	0	0	140	0
Disappearance	140	46	186	186
Ending Stocks	260	162	162	422

Note: 2014 South Dakota corn crop, second quarter (December, January, February) situation.

The range of possible off-farm disappearance depends on the level of inflows from on-farm sources. Should no bushels move to elevators or end-users, then off-farm disappearance could be solely from beginning stocks. If all bushels move to elevators or end-users, then off-farm disappearance would also include those additional beginning stocks. Whereas interesting conclusions may be drawn by comparing on-farm and total disappearance, the inability to accurately establish the degree of off-farm disappearance makes it an intractable variable to explain.

Results

Parameter estimates are reported in Table 2 for the three marketings models – one for each commodity. The dependent variables, quarterly marketings, are regressed on the expected price differences and quarterly dummy variables. The regression results indicate that the expected price difference is statistically insignificant in explaining marketings. The quarterly dummy variables are each statistically significant, consistent with persistence formulated by Cunningham, Brorsen, and Anderson (2007). Substantial inventory is marketed in the same quarter as harvest, and smaller amounts are marketed throughout the rest of the year.

Table 2. OLS Parameter Estimates for Quarterly Marketings

Variable	Corn	Soybeans	Wheat
Intercept	34.87*	48.31*	39.72*
	(1.23)	(1.27)	(1.21)
$E(PD_t)$	-1.67	-1.53	0.71
	(1.80)	(1.08)	(1.02)
Q2	-8.49*	-26.05*	-18.99*
	(1.72)	(1.77)	(1.70)
Q3	-17.25*	-32.95*	-17.58*
	(1.72)	(1.77)	(1.68)
Q4	-14.44*	-35.20*	-22.08*
	(1.72)	(1.77)	(1.68)
Adjusted R^2	0.49	0.81	0.63

Note: * denotes significance at the 0.05 level.

With an adjusted R^2 of 0.49, the corn model explains about half of the variation in corn marketings. All else equal, the significant intercept suggests about one-third of the harvested crop will be marketed during the harvest quarter. The sign of the expected price difference is consistent with a belief that an incentive to store would be a disincentive to market. About 26 percent, 18 percent and 20 percent of the harvested crop can be anticipated to be marketed in the second, third and fourth quarters, respectively.

The model for soybeans exhibits the best overall fit with an adjusted R^2 of 0.81. This is consistent with large, significant coefficients for the intercept and dummy variables. The estimate implies that, all else equal, about half of the crop can be expected to be marketed during the harvest quarter. About 22 percent, 15 percent and 13 percent of the harvested crop can be anticipated to be marketed in the second, third and fourth quarters, respectively. The sign of $E(PD_t)$ is again negative.

With an adjusted R^2 of 0.63, the wheat model explains a significant degree of the variation in marketings. All else equal, about 40 percent of the harvested crop will be marketed during the harvest quarter. Approximately 21 percent, 22 percent and 18 percent of the harvested crop can be anticipated to be marketed in the second, third and fourth quarters, respectively. The sign of $E(PD_t)$ is positive, suggesting other factors may be affecting behavior. Recall that the harvest quarter for wheat begins on June 1. Thus, much of the wheat is marketed prior to the corn and soybean harvest quarter begins.

The parameter estimates for the disappearance models are reported in Table 3. The dependent variables, on-farm disappearance and total disappearance, are regressed on quarterly marketings, the expected price difference, and the quarterly dummy variables. The regression results show that, as specified, marketings consistently explain disappearance levels, but with varying degrees of significance. The expected price differences coefficients are all positive, and only statistically significant for total soybeans. For each commodity, the parameters are better able to explain on-farm disappearance than total disappearance.

For all of the on-farm disappearance models, the intercept coefficients are large and statistically significant. The quarterly dummy variables are statistically significant, with the exception of *Q2* in the total corn disappearance model. The disappearance during this period is perhaps influenced by strong harvest effects in the prior quarter. The relative uniformity of the coefficient estimates indicates that a consistent portion of a given crop can be expected to leave on-farm storage after the harvest quarter. The total disappearance models exhibit some idiosyncrasies. The coefficients for the quarterly variables are smaller and less significant than those in the on-farm disappearance coefficients, and are less uniform.

The model for on-farm corn disappearance exhibits a good overall fit with an adjusted R^2 of 0.82, as well as sizable, significant coefficients for the intercept and dummy variables. The intercept coefficient implies that, all else equal, 41 percent of the crop can be expected to leave on-farm storage during the harvest quarter. About 21 percent, 14 percent and 14 percent of harvested crop will disappear from on-farm stocks in the second, third and fourth quarters, respectively. The sign of marketings is consistent with expectations, but with a small magnitude, suggesting a muted effect on disappearance. The sign of $E(PD_t)$ is positive, contrary to expectations. One possible explanation is that when farmers have an incentive to store, they may do so at an elevator or off-farm location. All else equal, about 25 percent of the harvested corn crop will leave total stocks during the harvest quarter. Roughly 24 percent, 18 percent and 15 percent of the harvested crop can be anticipated to disappear in the second, third and fourth quarters, respectively. The significant coefficient for marketings is consistent with farmers selling the crop and a fraction being consumed.

Table 3. OLS Parameter Estimates for Quarterly Disappearance

	Corn		Soybeans		Wheat	
Variable	On-Farm	Total	On-Farm	Total	On-Farm	Total
Intercept	40.94*	25.13*	50.62*	24.49*	44.79*	29.89*
	(2.90)	(2.98)	(3.23)	(3.29)	(4.49)	(5.12)
M_t	0.12	0.20*	0.26*	0.37*	0.36*	0.21
	(0.08)	(0.08)	(0.06)	(0.07)	(0.11)	(0.12)
$E(PD_t)$	0.99	1.99	0.72	1.54*	0.88	1.27
	(1.50)	(1.55)	(0.75)	(0.76)	(1.17)	(1.33)
Q2	-20.38*	-1.47	-41.23*	-7.29*	-36.54*	-8.09*
	(1.57)	(1.62)	(2.07)	(2.11)	(2.82)	(3.21)
Q3	-26.48*	-6.83*	-42.43*	-11.44*	-38.31*	-16.33*
	(1.96)	(2.02)	(2.44)	(2.49)	(2.70)	(3.08)
Q4	-27.04*	-10.21*	-43.99*	-15.47*	-35.28*	-9.84*
	(1.82)	(1.87)	(2.57)	(2.62)	(3.06)	(3.49)
Adjusted R^2	0.82	0.47	0.96	0.84	0.87	0.43

Note: * denotes significance at the 0.05 level.

The model for on-farm soybeans disappearance exhibits an exceptional overall fit with an adjusted R^2 of 0.96, as well as sizable, significant coefficients for the intercept and dummy variables. The coefficient for the intercept implies that, all else equal, 51 percent of the crop can be expected to leave on-farm storage during the harvest quarter. About 9 percent, 8 percent and 7 percent of harvested production will disappear in the second, third and fourth quarters, respectively. The sign for M_t is positive, as expected. The sign for $E(PD_t)$ is also positive. All else equal, about 24 percent of the harvested soybeans crop will leave total stocks during the harvest quarter. Disappearance of roughly 17 percent, 13 percent and 9 percent of the harvested crop can be anticipated in the second, third and fourth quarters, respectively. Again, the sign for M_t is as expected, although the coefficient is small, and the sign of $E(PD_t)$ is positive.

The model for on-farm wheat disappearance exhibits a good overall fit with an adjusted R^2 of 0.87, as well as sizable, significant coefficients for the intercept and dummy variables. The intercept coefficient implies that, all else equal, 45 percent of the crop can be expected to leave on-farm storage during the harvest quarter. About 8 percent, 6 percent and 10 percent of production will disappear in the second, third and fourth quarters, respectively. The sign of M_t is consistent with expectations. The sign of $E(PD_t)$ is positive. All else equal, about 30 percent of the harvested wheat crop will leave total stocks during the harvest quarter. Roughly 22 percent, 14 percent and 20 percent of the harvested crop can be expected disappear in the second, third and fourth quarters, respectively. The sign of M_t is again positive, as is the sign of $E(PD_t)$.

The impact of farmer-owned stocks in off-farm locations has grown in both absolute bushels and as a share of all stocks in off-farm locations. Consider the situation in 2014, the most recent year with complete marketings and stocks data. The South Dakota corn marketings and on-farm disappearance shares are shown in Table 4. In the harvest quarter, 54 percent of the 2014 bushels ultimately leave on-farm stocks and did not remain on the farm as of December 1. In contrast, producers only reported marketing a total of 31 percent of the 2014 corn crop during September, October and November. Thus, 23 percent of the crop changed location, but not ownership. The corn harvest was 787 million bushels, implying 181 million bushels were owned by farms in off-farm stocks. Similarly, the soybeans and wheat owned at off-farm locations totaled 52 and 22 million bushels, respectively, with the wheat stocks reflecting the adjustment for wheat harvest occurring one quarter prior to corn harvest. The sum across these crops suggests 252 million bushels in off-farm stocks. The off-farm stocks reported for all owners was 315 million bushels. Total reported off-farm capacity was 345 million bushels.

Table 4. 2014 South Dakota Corn On-Farm Disappearance and Marketings by Quarter

Quarter	On-Farm Disappearance (% of Harvest)	Marketed (% of Harvest)	Cumulative Difference (% of Harvest)
Sep-Oct-Nov	54	31	+23
Dec-Jan-Feb	18	27	+14
Mar-Apr-May	12	16	+10
Jun-Jul-Aug	15	26	-1

Retaining ownership by farmers is prevalent, especially in the harvest quarter. The crop is delivered to an elevator or end-user, but an ownership change or marketing is not reported as occurring. The cause of this may be an absence of on-farm storage capacity; the only way to not market the crop is to move it to off-farm storage. Farmers may also move the crop to off-farm locations to free up space for other crops, avoid difficulties maintaining the condition of crops, avoid eventual challenges delivering crops because of poor weather or poor road conditions and utilize pricing programs of buyers (e.g., delayed pricing contracts or delivery commitments).

Conclusions

Marketings by farmers and disappearance from on-farm stocks are interrelated across crops. Marketings are strongly explained by seasonal patterns, while not by anticipated market signals. Disappearance levels were not significantly explained by changes in price expectations. Disappearance differs from farms and from the system (on-farm and total). A strong seasonal effect, assessed with quarterly dummy variables, explains marketings and disappearance. This varies by crop, but the evidence of marketing persistence seen by Cunningham, Brorsen, and Anderson (2007) was substantiated by this analysis. The results from this research confirm the dominance of a mechanical marketing style over an active style at the state level for South Dakota.

As modeled, marketings can be forecasted using exogenous price expectations and quarterly dummy variables. Forecasted levels of marketings can then be used in the on-farm disappearance model with the exogenous variables to forecast on-farm disappearance levels. Farmer-owned stocks in off-farm locations are observed at a high percent of capacity, which has been a marketing concern in the region. Future research is necessary to account for the potential simultaneous nature of marketings and on-farm disappearance. For example, the level of delayed pricing may affect the bushels delivered, but not classified as marketed.

The high proportion of marketings and disappearance occurring during the harvest quarter is consistent with the conclusions of Lai, Myers, and Hanson (2003), whose assessment of the timing of storage throughout the crop year, observed that risk-averse farmers will sell a considerable portion of production right after harvest, unless spot prices are abnormally low. Harvest-period disappearance is notably concentrated for soybeans and wheat, while corn's market-year allocation is comparatively more constant.

The evidence of persistent marketing strategies follows the results of Kastens and Dhuyvetter (1999), who observed that producers assess a variety of indicators, subject to time and knowledge constraints and convenience. Many producers are responsible for every aspect of their farm's operation, and do not find it advantageous to exhaust finite time and resources selecting multiple occasions to market annually-produced crops.

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