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Indemnifying Asset Value Losses Related to Livestock Disease Announcements

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Introduction

The recent history of livestock disease outbreaks, including Bovine Spongiform Encephalopathy (BSE) and foot-and-mouth disease in the U.K. and BSE in the E.U., Canada, and Japan[2], demonstrate how devastating these outbreaks can be for livestock producers and related industries. The U.K. foot-and-mouth disease cost at least £9 billion (Campbell and Lee 2005). The U.K. BSE cases led to a 40% decrease in U.K. beef prices and decreased beef consumption across the E.U. As cases of BSE were found in the E.U., beef consumption fell by 30% (Fox and Peterson 2004) and export markets closed. As late as 2000, decreases of 20-50% of E.U. beef consumption were still being realized and in 2003 they were still 5% below previous levels (Jordan 2003). Burton and Young (1996) had previously predicted a 4.5% decline in market share through 2003. Fox and Peterson (2004) report that in 2001 alone the European Union paid over one billion euros to control BSE.

After the first reported case of BSE in Japan in September 2001, 60% of Japanese consumers ceased beef consumption (USDA FAS 2002; Mattson et al. 2005) and imports of Japanese beef were banned in nearby export markets. Retail beef sales fell 40-50% and wholesale prices fell 30-60% (Fox and Peterson 2004).

Even though identified BSE cases in Canada appear to have been very isolated, total economic impacts were valued at C$6.3 billion by November 2003, with C$3 billion attributed to equity loss in the Canadian cow-calf sector (Serecon Management Consulting Inc. 2003b). Although domestic demand was unaffected (LeRoy and Klein 2003), lost export markets were estimated to be C$500 million per month (Serecon Management Consulting Inc. 2003a; Fox and Peterson 2004), and live cattle prices fell by over 70% (LeRoy and Klein 2003). Cull cow prices plummeted to almost zero. Monchuk (2003) reported a producer receiving a net revenue of C$1.27 for a cull cow. More recent estimates put lost income alone at C$5 billion and perhaps as high as C$8 billion (Leiss 2005) with billions more lost by related businesses–trucking, input supply, equipment dealers, rural tourism, etc.

The United States has also had cases of BSE, the most recent being confirmed in June 2005, but the economic impact has been minimal. While experiencing an 82% decline in export markets, the U.S. domestic market has remained strong due, in part, to maintained consumer confidence in the safety of U.S. beef supplies. Since the first confirmed U.S. case of BSE, consumer confidence that U.S. beef is free of BSE has continually been over 89% (McCarty 2005). However, a loss of U.S. consumer confidence coupled with lost export markets would have devastating impacts similar to those experienced in the United Kingdom and Canada. Estimated BSE-induced losses from lost domestic consumer confidence and export markets range from $3.2 billion to $4.7 billion (Coffey et al. 2005). Based on 2004 beef production, Mattson et al. (2005) estimate that the U.S. cattle industry lost $1.38 billion. It is reasonable to expect that losses in related sectors would also be in the hundreds of millions, if not billions. Further, the losses estimated by Coffey et al. (2005) and Mattson et al. (2005) are

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[2] For an excellent history of the U.K., E.U. and Japan BSE cases, see Fox and Peterson (2004).

income losses, not equity losses associated with specialized beef production assets–breeding livestock, corrals, fencing, waterers, feed bunks and rangeland.

While the U.S. beef industry has mercifully been spared the double-whammy of lost export and domestic markets, the relevant policy question is how should the U.S. cattle industry and USDA prepare for this eventuality? There have been changes in regulations regarding the feeding of ruminant byproducts, slaughter restrictions on downer animals, and removal of nervous tissues prior to processing. While reducing the likelihood of BSE-infected animals reaching the food supply, these steps do not address the potential for unprecedented economic damage to an agricultural sector. We argue here that there is a need for tools that address the risk of low prices and asset value losses due to catastrophic disease-induced market events, such as BSE outbreaks. Further we suggest ways that USDA's Risk Management Agency (USDA RMA) could alter existing insurance programs to cover this eventuality. In the absence of such a program, there is little doubt that ad hoc disaster payments will be required if disease-induced catastrophic event is realized. Our proposed product would shift at least part of these payments to private insurers.

Beef Prices and Asset Values

The link between beef prices and beef production specific assets, such as pasture land, is clearly indicated by microeconomic theory. The demand for these assets, termed derived demand, is positively related to output price, i.e., beef price. So, if beef prices fall dramatically, it is economically rational to expect that the demand for the services of beef producing assets will decline, i.e., the value of these assets will also decline.

A simple time-series regression model empirically demonstrates the relationship. We regress county average pasture land values on beef prices and lagged beef prices in an AR(2) model. Data from 50 North Dakota counties from 1989 to 2003 are taken from North Dakota Agricultural Statistics Service (various years). The other three North Dakota counties are omitted due to insufficient data. All prices are inflated to 2003 dollars. The results, reported in Table 1, indicate that a decline of $1/cwt in beef price will result in a $0.78/acre decrease in pasture land value[3]. Coffey et al. (2005) estimate a decrease of $0.12 to $0.17/lb in carcass price after export markets are lost. Assuming a 63% dressing percentage, that equates to a reduction of $7.56 to $10.51/cwt for live beef price. The associated reduction in North Dakota pasture land value ranges from $5.90 to $8.35/acre. Given that there are approximately 12.4 million acres of pasture land in North Dakota (USDA NASS 2004), the loss in pasture value ranges from $73.1 million to $103.5 million.

[3] Most of North Dakota's range land has low value in alternative uses. As demonstrated by Torell et al. (2003), grazing land may have other uses that tend to support prices. With our econometric model we do not attempt to explicitly incorporate the impact of those uses due to a lack of data on other land uses/prices. To test for the effect of omitting this information, we estimated another model which included resident and non-resident hunting license sales as proxies for the impact of recreational uses on land values. These variables were significant; however, the coefficient on beef prices was only slightly changed to $0.776 from the original model of $0.784. So, it seems likely that the analysis in the paper reasonably captures the impact of beef prices on land values. Also note that the Torell et al. (2003) values are location specific. Ranch land in New Mexico provides amenities that are considerably different from North Dakota grazing lands. New Mexico's climate is considerably warmer than North Dakota's. (That's an understatement!) New Mexico grazing lands support larger elk, mule deer and antelope herds, and New Mexico offers more resident and non-resident hunting licenses. The more mountainous terrain of New Mexico may have more amenity value than the flat to rolling prairie of North Dakota.

Table 1. Regression results.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	169.1594	34.61852	4.886385	0.0000
BEEF	0.784101	0.075591	10.37294	0.0000
BEEF(-1)	0.050539	0.092497	0.546387	0.5850
AR(1)	0.814598	0.040081	20.32398	0.0000
AR(2)	0.129176	0.041019	3.149188	0.0017
R-squared	0.834441	Adjusted R-squared	0.833328	
Log likelihood -	2273.847	F-statistic	749.7202	
Durbin-Watson stat	1.932938	Prob(F-statistic)	0.000000	

This estimate is actually a conservative estimate of pasture land value declines. Coffey et al. (2005) report the decrease in price due to a loss in export markets, but no comparable number is given for a loss in domestic consumer confidence. Further, total lost asset value would be considerably higher. A total accounting would need to consider the reduced value of beef production specific assets, such as feed bunks, corrals, livestock trailers, etc., and some related assets, such as haying equipment.

The results demonstrate that beef cattle prices are important determinants of the value of beef production related assets. If producers are to be protected from the impact of catastrophic price fluctuations, the risk management strategy needs to consider asset value impacts in addition to annual price variability.

Livestock Insurance Products

USDA's Risk Management Agency currently offers two insurance plans, Livestock Gross Margin (LGM) and Livestock Risk Protection (LRP), to indemnify producers for income and price risks. The LGM provides insurance coverage on the difference between the expected market value of swine and feed costs (USDA RMA 2004a) and is currently only available in Iowa. LGM is similar to options except it is "a bundled option that covers hog price and feed costs (ibid)."

The LRP insurance programs, currently available in selected states, are identical to out-of-the-money put options. Coverage levels range from 75% to 95% of "expected ending value" which is equal to 95% of the futures price. Endorsement periods range from 13 weeks to 52 weeks. As some futures contracts are thinly traded, not all levels of coverage levels and endorsement periods are available. A producer can insure 1,000 feeder cattle at any given time and up to 2,000 feeder cattle per year. Premium schedules are available for heifers and steer calves under 600 pounds and for feeder heifers and steers between 600 and 900 pounds. USDA RMA provides a 13% subsidy on premiums (USDA RMA 2004b).

Proposed Livestock Insurance Products

The LGM and LRP products offer producers protection against income and price risks, but, as experienced in Canada, producers also face asset value and equity losses as livestock prices fall drastically. Given the demonstrated relationship between beef prices and pasture land values and likely relationships between beef prices and other assets, it is possible to employ the LRP in a cross hedge strategy to insure against asset value losses. This would involve a livestock producer insuring multiples of his/her calf crop or fed cattle, something that is not currently allowed under LRP and would be cost prohibitive under the current LRP premiums.

Using the 26-week contract, we estimate that North Dakota producers would need to purchase insurance on 9.38 times their expected calf crop to insure their calf-crop price, the value of their beef animals, and pasture land values for a full year. (A higher multiple would be needed to protect the value

of other assets.) For North Dakota producers the cost of these premiums, net of the 13% subsidy, would range from $30.2 million for 85.4% coverage level to $75.9 million for 93.3% coverage level. These are the lowest and highest coverage levels currently available for the 26-week endorsement. These premiums represent about 4.3% and 10.8% of the value of North Dakota beef production in 2004 and, so, are likely cost prohibitive.

Although theoretically possible, the problems with using the current LRP program to insure asset values are: 1) the cost of premiums are tied to all downside price fluctuations, as the program is designed to protect from downside price risk; 2) the program does not allow producers to insure multiples of their annual calf crop; and 3) the program is not available in all states. The latter two issues are regulatory in nature and would need to be addressed by USDA RMA. It is the first of these issues that are of concern to us. In particular, our concern is with price fluctuations that are due to catastrophic market events that are likely enduring, so have large negative impacts on producer income and asset values.

With some modification, however, an LRP-type product could be used to protect price and asset values against losses due to catastrophic market events. Our proposed modification is to use a two-stage trigger for indemnity payments. The first stage would be the announcement of a human-health threatening event, such as multiple confirmed BSE cases or confirmed cases of variant Creutzfeldt-Jakob Disease (the human version of BSE). The second stage would be large price reductions within a short time period (probably measured in days or weeks) following the announcement. As with LRP, price reductions must be large enough to trigger strike prices in the underlying options market. The first trigger, the disease announcement, occurs with a low probability, so the likelihood of indemnity payments is reduced. Assuming that USDA RMA premium subsidies would be applied to the modified program, premiums would then be a fraction of the current LRP schedule, due to the reduced likelihood of indemnity payments.

To demonstrate, we return to our previous North Dakota example. Assume for demonstration purposes that the likelihood of a catastrophic market event is 10%. In the previous example, we estimated that North Dakota producers would pay $30.2 to $75.9 million to insure the value of the pasture land, breeding livestock, and calf crop. Multiplying those estimates by the reduced probability of indemnity payments (10% in this example), yields premiums of just over $3 million to just under $7.6 million annually, or 0.43% to 1.08% of the annual value of beef production. While these are non-trivial amounts, they do not appear to be cost prohibitive.

Several issues would need to be addressed prior to offering this insurance product including the eligibility of producers in all cattle producing states, current rules do not allow insuring multiples of annual calf crop, and the development of a risk profile. USDA RMA has regulatory authority on the first two issues and could develop new rules or a new product to cover asset values. The third issue is of more interest to researchers. Fortunately for the cattle industry, few data exist regarding the likelihood and severity of a widespread or a low-level, enduring disease outbreak in the United States. It is worthy to note that the United Kingdom does have insurance products to cover foot and mouth disease and associated impacts. Producers can purchase coverage for up to 25% of the value of their animals. Combined with government compensation (100% of animal value), producers can receive up to 125% of the value of their animals. Rural businesses, including livestock markets, can also purchase coverage to protect against lost revenues during nearby outbreaks (Minoli 2003). (Perhaps similar products could be developed for U.S. beef-related and other rural businesses.)

Summary

To date, U.S. producers have been fortunate that domestic consumers have maintained their confidence in the safety of U.S. produced beef despite isolated BSE confirmations. U.S. exports of beef have declined by 82%. Further announcements, or cases of other transmissible diseases, could erode domestic demand. Coupled with lost export markets, U.S. producers would face reduced incomes, asset values, and equity, as have Canadian beef producers. Assets employed in beef production,

including pasture land, may have lower value in alternative production and recreational activities. Real estate, pasture and cropland, continues to be the largest asset category on agricultural producers' balance sheets. Current market-based and government-subsidized risk-sharing products do not cost effectively enable livestock producers to insure non-current asset values in the face of probabilistic BSE and other potentially transmissible disease outbreaks.

LRP, as currently designed, protects producers from large negative price fluctuations. With some simplifying assumptions, we show that the LRP insurance could be modified to cost effectively protect calf price and equity of beef producers. Although our demonstration is limited to North Dakota producers, the concept is generally applicable to all areas of U.S. beef production.

The importance of protecting farm equity to agricultural industries and rural economies cannot be overstated. In many livestock producing regions, such as the Great Plains, regional economies are driven by the jobs and wealth created by livestock production and related activities. Without the equity of livestock producers to finance producers' purchases of goods, services and capital equipment, rural communities would suffer further out-migration and declining economic fortunes.

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