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Was the Pea Futures Contract Doomed to Fail? An Analysis of the 1995 Canadian Contract[1]

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The Issue

Feed peas are relatively high in energy and protein and compete with other feed grains and protein crops in the livestock feed market. Prior to 1995, a futures market did not exist for this commodity. To meet industry demand for a hedging and forward pricing mechanism, the Winnipeg Commodity Exchange (WCE) introduced a feed pea futures contract in November 1995. This study investigates the Canadian feed pea market prior to and during the startup of this first WCE feed pea futures contract. In particular, the study explores whether the WCE could have conducted an analysis using then-existing data that would have assisted in the design and establishment of the futures contract.

The primary research objective was to determine the ability of the Winnipeg feed pea futures contract, as first specified in November 1995, to provide a price discovery mechanism and to reduce pricing risk. Historical feed pea price data and key concepts related to successful futures contracts were evaluated. Feed pea price data available to the WCE before and just after introduction of the futures contract were analyzed to compare pea prices in Canada to pea prices in Europe. This analysis evaluated the potential for success of the WCE feed pea futures contract. The analysis included (1) measuring absolute and relative price risk in feed peas and other North American crops; (2) comparing the basis (costs to move the product between one market and another) of feed peas to the basis for other crops traded between

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North America and Europe; (3) carrying out Granger causality tests to compare price determination in North America and Europe; and (4) conducting cointegration tests to assess the relationship between the Canadian and European feed pea markets. We argue that this is the analysis the WCE could have conducted to assist in designing and establishing the 1995 feed pea futures contract.

Implications and Conclusions

The feed pea futures contract, with delivery in Europe, failed to meet key criteria for contract success. The analysis indicates several reasons the original contract failed. Since many of the data used in the analysis carried out here were available at the time the futures contract was introduced, the WCE could have conducted a similar analysis to assist in the design and implementation of the contract.

Feed peas are a low price risk and low volume market relative to other North American crops. Complexities of currency exchange, high basis, and restricted ability to deliver on the futures contract all adversely affected the usefulness of the feed pea futures contract. The unusual specifications contained in the contract reduced its attractiveness for producers and speculators. Seasonal changes in the basis were found to be unusual in timing compared to other North American crops. This seasonality appeared likely to deter postharvest storage hedging by pea producers or processors. Granger causality tests showed information in price bids in Western Canada to be leading European pea prices. The futures market may have contributed little additional information to the price discovery mechanism. The combined effects restricted the usefulness of the contract to producers and speculators. Hence, the contract failed.

Background

Western Canada's production of feed peas increased from 168.8 thousand tonnes in 1985 to 1,762 thousand tonnes in 1997 (FAO, 1998). To put this into perspective, in 1995 the area in field pea production was greater than the area seeded into winter wheat or rye but still far below the acres allocated to canola or feed barley in Western Canada. The reasons for the growth in production were the development of pea varieties that were more suitable to Canadian growing conditions, depressed margins in conventional crops, and the need for diversification in production.

World pea production varied from 10.7 million tonnes (mmt) to 16.6 mmt in the 1990s, and averaged 13.4 mmt. World production for 1997 showed members of the former Soviet Union producing 20 percent, Europe 32 percent, Asia 15 percent, Canada 15 percent, Australia 3 percent, and other countries 12 percent. Canada contributed 31 per cent of world dry pea exports in 1997. Belgium was a major world importer, with 22 per cent of imports of feed peas in 1997 (FAO, 1998).

Traditionally, companies and brokers contracted for peas with producers in Western Canada after harvest, and the use of preharvest contracts for production of peas was small, at 10 to 20 percent of expected production (AAFC, 1994). As well, contracts that guaranteed price on all production were rare in special crops (Government of Saskatchewan, 1993). Consequently, before the introduction of the Winnipeg Commodity Exchange feed pea contract, market risk was borne mainly by producers, with few alternatives for transferring market risk.

The WCE opened trading on a feed pea futures contract in November of 1995. This was the first and only publicly visible pricing mechanism in the world for feed peas (WCE, 1995). Key features of the contract were (1) delivery specified in Belgium or The Netherlands, (2) pricing in United States currency and (3) delivery of either North American peas or Australian feed peas. The contract was directly tied to the pea market in Europe. The 1995 contract existed for several years, but was replaced in 1999 with a field pea contract, whose key features are (1) delivery at locations in Manitoba, Saskatchewan, or Alberta, (2) pricing in Canadian dollars, and (3) delivery of Canadian feed peas (WCE, 2000).

Contract design and specifications are important to the success of a futures contract. Common characteristics of commodities that are successfully traded in futures contracts include:

1. homogeneity of the product traded;
2. capacity to describe the commodity through grading and standardization;
3. variable and uncertain cash prices;
4. a large and active commercial market;
5. availability of public information;
6. an economic need for risk transfer;
7. evenly balanced exchange between buyers and sellers, and
8. a need for liquidity (Leuthold et al., 1989).

The major reasons a futures contract may fail include:

1. the contract is poorly written and favours either buyers or sellers, resulting in one side of the market refusing to participate;
2. commercial interests with market power refuse to participate;
3. legislative restrictions hamper or outright ban the contract;
4. changing market conditions result in a loss of the economic rationale behind the contract; and
5. failure to attract speculators results in a lack of liquidity (Leuthold et al., 1989).

Basis, the difference in price between two market prices, is a key component in the success of a futures contract because it affects the ability of market participants to hedge effectively. Basis consists of the direct and indirect costs to move the physical product between two

cash markets or to move the product to the delivery market specified by the futures contract. Easy product delivery with predictable costs is crucial in maintaining price relationships between markets. Easy delivery maintains the basis relationship between futures and cash markets.

Basing the feed pea futures contract on delivery in Europe brought ocean freight into the basis between the Western Canadian spot (i.e., cash) feed pea price and the feed pea futures contract. The predictability of the basis is critical to the success of a futures market (Brandt, 1985; Zapata and Fortenbery, 1996). The objective of hedging crop prices is to exchange greater price volatility for lesser basis volatility. Volatile or unpredictable basis reduces the advantages of hedging and reduces demand (i.e., market liquidity) for the futures contracts by growers and users of the commodity. Speculators also refrain from participating in the futures market if there are low levels of market liquidity.

The basis relationship between the Canadian feed pea spot market and the European feed pea spot market (the delivery point for the feed pea futures contract) becomes critical to the success of the contract. Low levels of price risk or small commercial markets also reduce the demand for futures contracts for hedging or speculative purposes. Data on the feed pea market were analyzed to determine the likely success of the WCE feed pea contract as specified upon introduction to the market in 1995.

Data and Methodology

The data for this study spanned the period May 1988 through June 1996. Monthly and weekly observations were used, and the data were from various sources (Lyster, 1999). Data were not pooled and the level of aggregation was similar within each analysis (for example, monthly data were compared only to monthly data). The data included prices for Western Canadian farm gate feed peas, Thunder Bay feed peas, European spot feed peas, and other spot or futures commodity prices (e.g., soybean, canola, corn, and barley). Soybean and canola both provide protein meal and are substitutes for feed peas. Corn and barley provide energy and are also substitutes for the feed pea energy component. In addition, data on cash Canadian exchange rates with U.S. dollars were collected, as well as freight rates from the St. Lawrence, Great Lakes, and Gulf ports to the European ports of Antwerp and Rotterdam.

Analyses included a qualitative evaluation of the feed pea contract relative to the ideal futures contract traits summarized above. The quantitative analysis measured cash pea price risk and compared the risk of alternative feed grains or protein sources through absolute price risk (standard deviation) and relative price risk (coefficient of variation) measures. This included evaluations of the basis component, freight risk, and exchange risk. Basic descriptive statistics of various crops were used to compare markets between North America and Europe.

The second focus of this study was that of causality. The location of price formation is of interest to those who are looking for leading indicators, and for indications of how the mar-

ket price is established. Testing for the direction of price formation in North American and European feed pea markets was done using Granger causality criteria.

The third area researched was cointegration, the strength of the price relationship between markets. Prices in cointegrated markets have a strong tendency to move together in long-run equilibrium relationships. Cointegrated markets have lower basis risk. The equilibrium price relationship between the Canadian and European pea spot markets was tested using standard cointegration tests (Shazam, 1997) based on the Phillips-Perron and Dickey-Fuller type tests.

In summary, basis risk was compared for crops traded between North America and Europe. Price risk for peas was measured and compared to that for other crops using standard deviations, coefficient of variations and correlations. Granger tests were used to determine if European feed pea markets contain additional market information not already contained in Western Canadian feed pea prices. Cointegration tests between Western Canada and Europe further evaluated the strength of the price relationship between various markets.

Qualitative and Statistical Analysis

The specifications of the 1995 Winnipeg feed pea futures contract differed from other agricultural futures contracts commonly found on North American futures commodities markets. Once the decision was made to use a European delivery location, some unusual specifications for feed peas were necessary. Some of these specifications, such as multinational sources of product, were an attempt to broaden the market for the contract. The unusual specifications added complexity (e.g., exchange rate, heterogeneous product definition, basis), decreased price discovery transparency (e.g., delivery location, exchange rates, basis calculations), created new sources of risk (e.g., exchange risk, basis risk), and restricted delivery (e.g., delivery location, deposits). Concerns about the size of market participants, homogeneity of product, ability to enter or exit the market, and level of transaction costs made the contract difficult to use for hedging. Most of these modifications detracted from the usefulness of the feed pea contracts to short hedgers by increasing basis and exchange risk. The qualitative analysis of the contract indicated that the contract provided few advantages to short hedgers (such as Canadian pea marketers), although it may have been attractive to European buyers (long position) by reducing basis risk in Europe.

The quantitative statistical analysis determined that feed pea prices in Europe had a mean price about $32.42 per tonne higher than Thunder Bay pea prices (i.e., $165.66 versus $133.24, table 1). European feed pea prices also had a higher standard deviation than Thunder Bay prices (i.e., $26.33 versus $21.67). All prices in table 1 are quoted in U.S. dollars per tonne and the price data were adjusted for inflation to the year 1988, using Canada or U.S. Consumer Price Indexes. Great Lakes freight rates from Thunder Bay to Eastern Canadian ocean ports had a mean cost of $21.94 per tonne and a standard deviation of $3.80 per tonne. The potential for freight rate changes to lead to an unstable basis is suggested by the follow-

ing: freight consisted of over 25 percent of the farm gate price of feed peas. For corn (16 percent), soybean meal (6 percent) and soybeans (5 percent), freight rates were a far smaller proportion of farm gate prices.

Table 1 Price Mean, Median, Standard Deviation, and Coefficient of Variation for Selected Crop Prices, May 1988 – June 1996 (constant 1988 US $/tonne)

Data crop (variable)	Mean price	Median price	Standard deviation	Coefficient of variation
Peas farmgate W. Canada	120.54	117.48	20.68	0.172
Peas Thunder Bay	133.24	128.94	21.67	0.163
Peas Europe	165.66	163.39	26.33	0.159
Canola Alberta cash	205.45	199.02	29.57	0.144
Canola WCE futures	238.99	236.15	31.81	0.133
Barley Alberta cash	66.90	62.73	15.59	0.233
Oats Alberta cash	72.44	66.12	20.74	0.286
Oat WCE futures	83.94	75.36	24.06	0.287
Wheat Alberta cash	80.06	79.40	23.45	0.293
Wheat WCE futures	90.63	85.52	23.96	0.264
Corn cash	84.74	83.31	15.11	0.178
Corn futures	87.77	85.50	15.39	0.175
Corn cash export	98.42	95.40	16.28	0.165
Oats US cash	104.58	89.81	36.52	0.349
Oat US futures	91.06	79.21	30.91	0.339
Wheat US cash	113.90	109.67	21.74	0.191
Wheat US futures	116.16	112.01	22.13	0.190
Bean oil cash	433.35	425.07	63.36	0.146
Bean oil futures	432.83	422.61	60.43	0.140
Soybean cash	196.01	186.97	37.23	0.190
Soybean futures	199.49	190.12	38.52	0.193
Soybean meal cash	177.48	164.37	40.71	0.229
Soybean meal futures	182.94	171.05	38.06	0.208
Corn cash Europe	110.49	106.50	16.50	0.149
Soybean cash Europe	223.42	212.69	38.81	0.174
Soybean meal Europe	185.66	172.94	40.86	0.220
St. Lawrence ports to Europe freight	9.47	9.94	2.14	0.226
Great Lakes ports to Europe freight	21.94	22.20	3.80	0.173
U.S. Gulf ports to Europe freight	10.58	10.37	1.95	0.185

Estimates of the absolute risk in feed pea prices, measured by standard deviations of these price series, are shown in table 1. Higher levels of price risk increase the demand by market participants for tools to manage price risk. Canadian feed pea prices exhibited lower absolute price risk than European pea prices. The coefficient of variation for peas, a measure of relative risk, was similar to U.S. corn prices. Relative risk for feed pea prices in Canada was slightly higher than the relative price risk in Europe. U.S. currency changes were included in these feed pea calculations of risk. Generally the absolute price risk for feed peas was less than that for most other competing grains or oilseeds, and the relative price risk for peas was in the lower range of results reported (table 1). Similar results were found when the analysis was conducted using nominal prices in local currencies.

The price risk for feed peas was low when compared to other crops. There are successful futures contracts having standard deviations or coefficients of variation similar to those for peas. As shown in table 1, these include bean oil, corn, and canola. However, corn is the only other commodity that showed both low absolute and low relative risk. The low absolute and relative risk in feed pea prices may make hedging by producers less of a priority than for other crops grown in Western Canada. The low absolute and relative risk in Europe may also make a feed pea futures market less attractive to speculators or European feed pea buyers. These relatively low price risk levels were likely detrimental to the success of a feed pea futures contract.

The correlations between pea prices in North American and European markets were high, with a range of 0.936 to 0.965. The simple correlation between Western Canada farm gate feed pea price (converted to constant 1988 US $) and European feed pea price was 0.936. This was only slighter lower than the correlation between U.S. soybeans and European soybeans. However, when correlations were done in nominal dollars comparing farm gate feed pea prices (Cdn $) to European feed pea prices (US $) the correlation dropped to 0.53, indicating the role of currency exchange in basis. The correlation between nominal Thunder Bay feed pea prices (Cdn $) with farm gate prices (Cdn $) was 0.94, but between Thunder Bay feed pea prices and European feed pea prices (US $), it was 0.53. Changes in ocean freight and currency values added to the basis risk between Canadian feed pea prices and European feed pea prices.

Freight was the major component in the pea price basis between North America and Europe. The freight component of basis for peas priced at Thunder Bay and then priced in Europe averaged 67.7 percent of total basis; for peas priced at the farm gate and then in Europe the freight component averaged 69.5 percent of the total basis. Soybean and corn had about 40 percent of the total basis absorbed by freight when comparing U.S.-based prices to European-based prices. Feed pea basis in Canada, with or without the rail component, had a high absolute and relative freight component when compared to other U.S. crops exported to Europe.

Simple regressions between Canadian farm gate feed pea prices and European feed pea prices were used to measure the monthly seasonality of basis (figure 1). The linear regression model used Canadian farm pea price as the dependent variable and European spot pea price as the independent variable. Dummy variables for each month and a time trend were included in the model. Analysis was done with weekly prices adjusted to Canadian dollars and none of the prices adjusted for inflation.

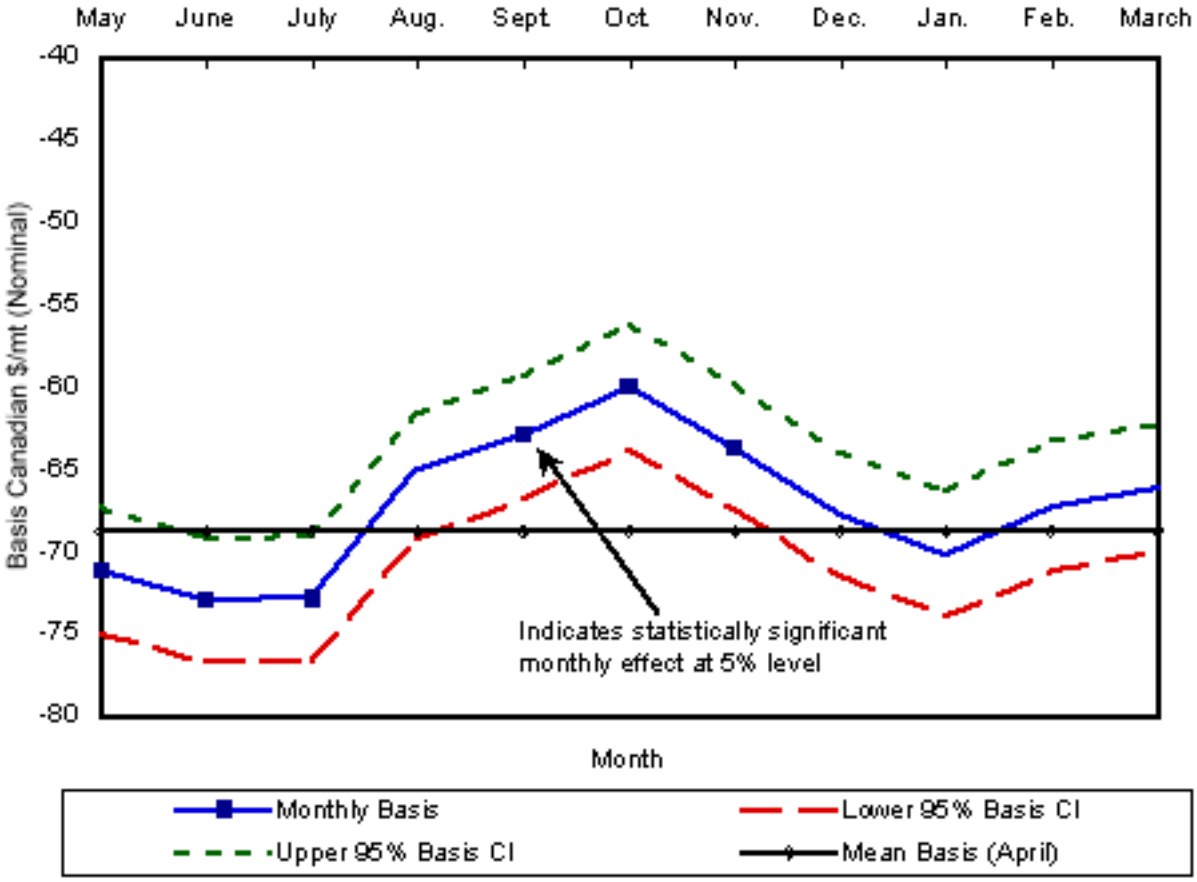

Figure 1 Basis seasonality between Western Canada pea prices and European pea prices, 1988–1996

The regression results were not generally consistent with the expected theory. Theoretically, the basis between the local market and the key price-setting markets is expected to be widest at harvest, and to narrow later in the crop year (Leuthold et al., 1989) for storable commodities when adequate supplies are available. During the study period the narrowest basis (i.e., highest Canadian pea price relative to the European pea price) occurred at harvest during the fall time period. Basis widened (i.e., the Canadian price dropped relative to the European price) later in the crop year (figure 1). Similar results to those shown in figure 1 were

found when the regression was estimated using data adjusted to constant 1988 U.S. dollars. The seasonal pattern exhibited by feed peas may have been due to the need to physically move peas before the freeze-up of the Great Lakes, when the increased costs of rail movement to the St. Lawrence ports were greater than the costs of storage and interest.

Granger causality tests that evaluated the direction of price information flow indicated that the European price for feed peas was led by the Western Canadian price for feed peas. A possible explanation is that feed pea buyers in Western Canada may have had superior supply information and may have been successfully forecasting the feed pea prices in Europe. Cointegration tests between the market price for peas in Western Canada and peas in Thunder Bay did not reject the cointegration hypothesis. The hypothesis of cointegration of Western Canadian pea prices and European pea prices was rejected by the augmented Dickey-Fuller test but not rejected by the Phillips-Perron tests. As a result, the evidence was mixed on the strength of the economic relationship between the Western Canada feed pea price and the European feed pea price.

Concluding Remarks

The analysis of data available to the WCE for the period 1988 to 1996 and prior to specifying the contract indicated several problems with the futures contract implemented in 1995:

1. The basis in absolute terms and in terms of freight risk between Europe and Canada was large. Delivery to Europe would be difficult to expedite in a timely manner, especially during the winter when the Great Lakes are frozen. The freight component of pea basis represented a larger proportion of the basis than is the case with other crops traded with Europe.
2. The relative and absolute price risks associated with peas were not large when compared to other crops. Corn had a similar risk profile but the commercial volume of corn trading differs markedly. Recent data place world corn production at fifty times that of dry peas.
3. There was evidence that the existing feed pea traders in Western Canada were successfully forecasting and leading the price changes in European feed pea prices.
4. Canadian producers of feed peas would have to assess the Canada-U.S. currency risk when hedging using the WCE 1995 feed pea futures contract. The U.S. currency specified in the futures contract added to the pea price risk between Canada and Europe.
5. The narrower basis between Western Canada and Europe in the fall and the widening basis later in the crop year favoured preharvest hedging and was detrimental to postharvest hedging. If basis is expected to widen after the fall season, there is less incentive for Western Canadian farmers to store peas on the farm or enter into postharvest hedges. Western Canadian farmers may also be reluctant to hedge significant quantities of

expected production prior to harvest. Other research indicated that preharvest hedging by Western Canadian farmers of canola, a crop for which a successful WCE futures contract exists, was limited (Unterschultz and Novak, 1997). Prairie producers of feed peas may also have been reluctant to hedge large quantities of expected pea production prior to harvest due to production uncertainty or other risk factors. This would significantly reduce the use of the feed pea futures contract for preharvest hedging.

The success of a futures contract requires the participation of all those involved in the market. Problems of specification, lack of use by major traders (University of Saskatchewan, 1997), contract complexity, and lack of delivery opportunities for producers, combined with a non-volatile cash price made speculative activity unattractive and contributed to a contract that proved to be of limited value to potential participants. During the initial years of the pea futures contract, producer hedgers had low participation rates for reasons suggested above. Low participation rates also arose because the cash trade appeared to be already cushioning the price volatility, thus reducing the need for price protection. The lack of small hedgers combined with the lack of volatility may have kept the speculative trader out of the market and led to a feed pea contract with very low trading volumes. Hence the futures contract for feed peas introduced by the WCE in 1995 was almost destined to fail. It may be that the WCE specified the contract in the way it did in order to secure participation in this contract by the Australian as well as the Canadian pea trade. While the Australian data are not examined in this study, factors that are examined, such as freight-related basis risk and currency risk, likely also precluded the Australian pea trade from active participation in the 1995 futures contract.

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