Determinants of Agricultural Futures Price Volatilities: Evidence from Winnipeg Commodity Exchange

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INTRODUCTION

The volatility of futures markets has received a great deal of attention in recent years. Following the hypothesis put forward by Castelino (1981) based on Samuelson (1965), several other reasons have been suggested to explain the nonstationarity observed in futures prices. Anderson (1985) argues that seasonality is the main predictable factor of the non-stationarity of the variance of futures price changes, and that time to maturity is a secondary factor. Milonas and Vora (1985) among others present evidence that year, calendar month, and contract month also affect futures price volatility. Moreover, some recent studies show that the variance of price changes in futures markets is higher during trading sessions than it is during non-trading periods. Until now, however, most, if not all, the literature devoted to the examination of this issue has been uniquely American. Given the specific characteristics of Canadian Futures markets, it is appropriate to verify those results for Canadian markets.

Indeed, Canadian commodity futures offer some unique features that make them worthy of particular attention. To start with, Winnipeg conducts the only canola, barley, and rye futures markets in the world, and the only flaxseed futures market in North America. Canola and barley are effectively arbitraged against corn and soybean futures in Chicago [Carter (1989)]. Winnipeg also conducts a market in oats, feed wheat, feed barley, and western domestic feed barley. From a structural point of view, during the period under study, the market for wheat, barley and oats[1] in Canada was strongly influenced by the policies of the Canadian Wheat Board, a Crown Agency, that acts as the sole distributor and gives suppliers an equal opportunity to deliver grain through a quota system. By announcing a support price early in the season, and standing ready to adjust it if needed, the board smoothes out supply and demand shocks in these two markets. Such is not the case for canola, flaxseed, and rye which are marketed entirely by private traders. It is,

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[1]As of July 1989, the Wheat Board no longer intervenes in the oats market.

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therefore, of interest to compare the non-stationarity of futures prices across those two market settings, and with the U.S. futures markets.

This article focuses on the volatility patterns of six commodities traded at the Winnipeg Futures Exchange and how they are influenced by trading and non-trading sessions and by maturity, calendar month, contract month, and year effects. The next section presents a brief overview of the relevant literature emphasizing competing hypotheses that have been advanced to explain the phenomena under study. In the second section the data are described and the methodologies used are discussed. The third section gives the empirical results and their interpretation.

REVIEW OF THE LITERATURE

Five sources of the volatility on agricultural futures markets have been identified in the literature. They are: the year effect, the calendar month effect, the contract month effect, the maturity effect, and the trading session effect.

The first three effects are well analyzed in Milonas and Vora (1985). As they indicate in their study, the year effect refers (1) to random shocks to supply and demand conditions arising from political decisions or unexpected severe weather conditions (such as grain-export embargoes, storms, etc.) and (2) public policies (such as government support prices) occurring in specific years and affecting one or several crop cycles. Calendar month effect or seasonality effect reflects the fact that price volatility increases during months of yield uncertainty, such as summer months when information on changing weather conditions have the most effect on expectations about crop size and quality. Contract month effect reflects price volatility arising from the uncertainty about the conditions of the new crop during delivery months of contracts maturing before the new harvest time. Analyzing five agricultural futures for the period 1972–1983, Milonas and Vora (1985) reported strong evidence of year and calendar month effects in all cases, and mixed results for the contract month effect. In the same vein, Kenyon et al. (1987) examined the month effect for corn, soybeans, and wheat futures. Their results support the presence of yearly random shocks and monthly seasonal effects on price volatility in these markets. Fama and French (1987) and French (1986) also reported seasonal variations in the basis for U.S. commodity futures, while Khoury and Yourougou (1989), conducting their tests on a weekly basis, found no evidence of seasonality effects for weeks 1 to 8 before maturity in the Canadian feed wheat market. Their results for weeks 9 to 36 are mixed.

Maturity effect has to do with increasing volatility as contracts approach their expiration date. According to Samuelson (1965), futures prices adjust to new information more quickly as maturity draws nearer. This results from the fact that spot and futures prices must converge at maturity. Later work by Stein (1979) casts Samuelson's hypothesis as a special case within a more general framework concerning the resolution of uncertainty. Barring seasonal effects, as contracts near maturity and uncertainty fades, futures prices become more volatile as they react more strongly to new information. The verifiable hypothesis of this is that the volatility of price changes grows larger as contracts approach maturity.

Several empirical studies have examined Samuelson's hypothesis. Among these, the articles by Miller (1979), Castelino and Francis (1982), and Milonas (1986) show strong evidence of maturity effect on the volatility of futures prices. Rutledge's study (1976), on the other hand, reports mixed results; while Kenyon et al. (1987) and Anderson (1985) show that seasonality is a better explanation of the increased volatility of futures prices than maturity. Khoury and Yourougou (1989) examined the ratio of the variance of futures price changes to the variance of spot price changes in the Canadian feed wheat market. Their findings are consistent with Samuelson's hypothesis and confirm that futures prices presumably adjust more strongly to new information as maturity draws nearer.

As regards trading session effects, the issue is whether price volatility emanates only from the random arrival of new information or whether trading itself creates volatility. A corollary concern is whether volatility remains the same when the exchange is closed as when it is open. Several studies have investigated this issue in the U.S. security and futures markets. Among these, French and Roll (1986) examined the risk-return relationship between overnight and day trading as well as during intra-day trading on the stock market and found that volatility is far larger when the market is open than when it is closed, suggesting that trading itself induces volatility. In the same vein, Ferris and Chance (1987) examined U.S. Treasury Bond Futures, prior to the advent of evening trading on April 30, 1987, and reported trading-day price volatility two to three times greater than that of overnight nontrading. Hill, Schneeweis, and Yau (1990) examined Eurodollar and U.S Treasury bond futures market for the periods of July and August of 1986, 1987, and 1988 and presented evidence that variance of price changes is higher during trading than during non-trading sessions. A similar conclusion was reached by Lauterback and Monroe (1989) for gold futures.

These results could be interpreted along the line of the Ross (1989) hypothesis, namely, that in the absence of arbitrage opportunities, price volatility is a function of the rate of information flow to the market. To be sure, in the studies examined above, information is revealed mostly during trading sessions, which may explain the relatively higher variance observed during that time period. Futures prices of agricultural commodities, on the other hand, are strongly influenced by weather conditions. It is not known whether volatility in agricultural commodities differs between trading and non-trading sessions since information about the weather is not disseminated solely during trading hours.

Addressing a similar issue, Jordan, Seale, Dinehart, and Kenyon (1988) investigated the intraday variability of soybean futures transaction prices for the period January, 1978 to October, 1984 and reported a well-defined "U Shaped" pattern.[2] The authors attribute the early day higher variance to the absorption of information generated while the market is closed. Information effects, however, do not explain the other leg of the "U," which leaves trading noise as a plausible explanation. Such noise, in the case of futures markets, may result from informationless trading, particularly by scalpers [Silber (1984)]. On the other hand, Cornett and Trevino (1989) studying intra-month returns for corn, soybean, and wheat futures report higher average daily returns in the first part of the month relative to the second but do not find a plausible explanation for this phenomenon. More recently, Milonas (1991) examined the half-month effect in the case of corn, wheat, soybeans, soybean meal, and soybean oil for the period 1966 to 1986 and reported half-month effects in cash prices for the first four commodities.

Against this background of U.S. empirical evidence, this study seeks to verify the non-stationarity of Canadian agricultural futures prices and to analyze their sources. The findings of the study could also enhance the understanding of international similarities in futures price behavior.

DATA AND METHODOLOGY

Daily data of high, low, open, and close prices for canola, rye, feed barley, feed wheat, flaxseed, and oats futures are from the records of the Winnipeg Commodity Exchange, for

[2]Lockwood and Linn (1990) among others reported similar findings for intraday stock return volatility.

the period of March, 1980, to July, 1989. As mentioned earlier, the first three commodities are chosen because Winnipeg conducts the only futures market in the world in them. It also conducts the only North American market in flaxseed.

Designated delivery months for commodities are an important consideration in the study of non-stationarity of futures prices. Delivery months for rye, barley, flaxseed, feed wheat, and oats contracts are March, May, July, October, and December.[3] For the canola contract, the delivery months are January, March, June, September, and November. Canadian contracts usually do not exceed 12 months. To establish a continuous futures price series when computing average variances, the first contract is chosen and 2 weeks before expiration the next nearby contract is used and so on.[4] This procedure is similar to the procedure followed by Ollermann et al. (1989), Hill, Schneeweis, and Yan (1990), Lauterbach and Monroe (1989) and others.

To investigate the maturity effect on futures prices, the relationship between the variance of futures price changes and the time remaining before maturity is examined. Following Milonas (1986) the variances of the natural logarithm of futures closing price relatives are first calculated on a contract by contract basis for non-overlapping monthly periods. These variances are averaged geometrically and then normalized.[5] This procedure ensures that changes in variances solely reflect the effect of time to maturity. The hypothesis to be tested is that the variance of futures price changes is negatively related to time remaining before maturity.

To test the above hypothesis the following ordinary least squares regression model is run:[6]

$$\mathrm{Ln}(\mathrm{NAV}) = c + b(\mathrm{Time}) + e \tag{1}$$

where:

NAV = normalized average variance of futures closing prices
c = estimate of the natural logarithm of spot price variance (assumed constant)
b = estimate of the time to maturity coefficient
Time = time to maturity
e = error term

The intercept term is the estimate of the natural logarithm of the spot price variance and is therefore expected to be significantly greater than zero. Under the hypothesis that price volatility increases as maturity draws nearer, b should be statistically less than zero. The error term is assumed to be normally distributed with mean zero and constant variance.

The arithmetic averages of the geometrically normalized variances computed above are then used in an ANOVA test to verify the significance of the contract month effect. Under the hypothesis of futures price stationarity, normalized average variances should be equal for all contract months implying no harvest effect in delivery months for maturing contracts covering old crops.

[3]November contracts were initiated on January 25, 1988 for wheat, oats, and barley, but are now discontinued. These contracts are not included in the study.

[4]Discussions with the senior economist at the Chicago Board of Trade and with the President of the Winnipeg Commodity Exchange indicate that such a procedure is appropriate since reported futures prices close to maturity are notoriously distorted.

[5]Milonas and Vora (1985) argue that this procedure ensures that the variances do not depend on the year and the month in which they are observed.

[6]See Milonas (1986) for the theoretical justification of the model.

To examine the year effect, an ANOVA test is run using the monthly variances calculated earlier to verify the year-to-year differences in average variances.[7] The null hypothesis that the yearly variances are equal is then tested against the alternative that at least one yearly variance significantly differs from the others. The monthly variances are also used in the ANOVA test to verify if they differ from one month to the other.

Finally, to test for the trading session effect, the daily variances of the logarithm of price relatives are calculated using (1) the daily open to open and close to close prices and (2) the close to open and open to close prices. Daily variances are calculated also using the daily high and low prices as in Parkinson (1980). Weekend variances are calculated using Friday close to Monday close and Friday close to Monday open prices.

Two hypotheses, namely, (1) calendar time and (2) information flow, could be advanced to explain the trading session effect on volatility. The calendar time hypothesis postulates that price changes are a function of calendar time only. Under this hypothesis, for example, the average variance of Friday close to Monday close price relatives should be some scalar multiple of the average variances of Monday open to Monday close price relatives. Alternatively, under the information flow hypothesis, price changes are function of the rate of information flow [Ross (1989)].

Given that the information about weather conditions, (public information) which largely determines the prices of most agricultural commodities, is disseminated almost randomly during trading and non-trading hours, the variances of price relatives should be about the same on average per unit of time during these two periods. A finding of a significantly higher price volatility during trading sessions for the contracts under study would indicate that trading generates its own volatility, probably because of private information revealed thru transactions and/or temporary errors in prices induced by informationless trades.

RESULTS

Tables I and II set out the results of the maturity effect for the six commodities under study. As Table I shows, the F statistics reject the hypothesis that the average normalized variances remain constant as contract time to maturity draws nearer in all cases. Indeed, even a quick look at Table I reveals that variances increase as contracts get closer to maturity in most cases. These observations are confirmed also by the regression results presented in Table II. The estimates of coefficient b shown in the table are negative and significant at 0.01% level for all commodities. These results are consistent with the findings reported by Milonas (1986) for the U.S. market, and by Khoury and Yourougou (1989) for the Canadian wheat market. Tables I and II also reveal that the three commodities for which the Wheat Board smoothes out supply and demand shocks—namely barley, oats, and feed wheat—exhibit stronger maturity effects than the other three. Indeed, the R^2 are relatively larger and the b coefficients stand at a relatively higher level of significance in the case of barley, oats, and feed wheat.

The statistical results reported in Table III with regard to the year effect are mixed. Indeed, the table shows that for the three commodities subject to the Wheat Board quota system, there is not enough evidence to reject the null hypothesis that average volatilities are equal from year to year. Such is not the case for flaxseed and rye which are traded in a free market. This evidence suggests that the Wheat Board price support system is largely responsible for ironing out year-to-year price volatilities in the commodities

[7]It should be noted that the one-way ANOVA test is valid only if the population is normally distributed with equal variances.

Table I
MATURITY EFFECT: NORMALIZED AVERAGE VARIANCES

Time to Maturity	Barley	Oats	Flaxseed	Rye	Feed Wheat	Canola
0	2.049511	2.010364	1.053455	1.321021	1.913211	0.909421
1	1.292778	1.320955	1.048297	1.148802	1.237121	1.126035
2	1.140924	1.134333	1.045041	1.082614	1.087499	1.139638
3	0.897028	0.917036	1.017992	1.068027	0.870200	1.298190
4	0.917280	0.870403	0.981722	1.080193	0.931297	0.914791
5	0.833089	0.826435	0.959466	0.955888	0.800191	0.975953
6	0.783847	0.834852	0.942553	0.861773	0.794505	0.925787
7	0.780824	0.744314	0.941996	0.787680	0.814526	
Obs.	311	293	279	275	282	219
DF	7/304	7/286	7/272	7/268	7/275	6/213
F	14.58	12.86	2.29	4.04	20.31	2.62
$Pr > F$	0.0001	0.0001	0.0279	0.0003	0.0001	0.0178

under its control. These findings differ in this respect from those reported by Milonas and Vora (1985) for the U.S. market. Although canola is traded in a free market, the data do not indicate statistical differences in year-to-year price volatilities. One possible explanation could be that canola futures price volatility is mainly determined by relatively stable international market conditions during the period under study. Indeed, almost half the Canadian canola production is exported but mainly to a single country, Japan. Such market demand conditions may have mitigated year-to-year differences in price volatilities in this case.

Table II
MATURITY EFFECT: THE REGRESSION OF NORMALIZED AVERAGE VARIANCES ON TIME TO MATURITY
$\mathbf{Ln}(\mathrm{NAV}_t) = c + b(\mathbf{Time}) + e_t$

Commodity	*c*	*b*	$\hat{R}^2$	*F*-stat	*DF*
Barley	0.34349	−0.10879	0.3132	141.377	310
	(9.061)	(−11.890)		[0.00]	
Oats	0.34267	−0.11538	0.2767	111.716	292
	(7.957)	(−10.570)		[0.00]	
Flaxseed	0.05012	−0.01908	0.0598	17.692	278
	(2.782)	(−4.206)		[0.00]	
Rye	0.18280	−0.06174	0.1291	40.621	274
	(4.811)	(−6.373)		[0.00]	
Feed	0.30072	−0.10169	0.2684	103.111	281
wheat	(7.366)	(−10.154)		[0.00]	
Canola	0.17614	−0.03966	0.0461	10.53	218
	(2.989)	(−3.245)		[0.001]	

( ) indicate *t*-statistics.
[ ] indicate *P*-value for the *F*-statistics.

Table III
YEAR EFFECT: ANOVA TEST OF EQUALITY OF AVERAGE VARIANCES

Calendar Year	Average Monthly Variances $\times 10^{-3}$ Barley	Oats	Flaxseed	Rye	Feed Wheat	Canola
1980	0.156	0.136	0.220	0.148	0.148	0.217
1981	0.100	0.102	0.110	0.238	0.136	0.110
1982	0.130	0.230	0.130	0.150	0.122	0.072
1983	0.194	0.176	0.122	0.188	0.118	0.204
1984	0.090	0.076	0.138	0.138	0.058	0.642
1985	0.088	0.098	0.086	0.078	0.094	0.100
1986	0.328	0.136	0.130	0.210	0.154	0.148
1987	0.146	0.234	0.216	0.198	0.146	0.190
1988	0.260	0.317	0.187	0.153		0.165
Grand mean	0.161	0.160	0.146	0.166	0.122	0.208
obs	43	43	40	40	40	40
DF	8/34	8/34	8/31	8/31	7/32	8/31
F stat.	1.68	1.84	4.81	3.48	1.04	0.989
P value	0.14	0.10	0.001	0.006	0.43	0.464

Table IV presents the ANOVA tests results for the calendar-month effect. The F statistics shown in the table clearly reject the null hypothesis that average variances are equal in the case of barley, rye, feed wheat, and canola. Indeed, as expected for agricultural commodities, futures price volatilities are higher in the summer and early fall and low in winter. It should be noted that although the F statistics are not significant in the case of flaxseed and oats, these commodities exhibit nonetheless their highest volatilities in the summer and early fall and their lowest volatilities in the winter. By and large, these findings are consistent with those reported by Kenyon et al. (1987) and by Milonas and Vora (1985) for the U.S. The highest variances reported in Table IV for feed wheat occur in July and September in Canada, while they occur in June and August in the U.S. [see Milonas and Vora (1985)]. This reflects the earlier arrival of summer in the U.S.

Results for the contract-month effects are reported in Table V. To conduct the ANOVA tests in this case, the geometric average variances are normalized to make them independent of the year and month in which they are observed [see Milonas and Vora (1985)]. As the table shows, the F statistics are not significant, in general, at the 10% level in all cases except barley. This indicates that contract-month does not seem to make a statistical difference in terms of futures price volatilities. In the case of barley, the futures price volatility of the May contract is the highest and is statistically different from the other contract months. Although the May contract is not significantly different from other contract months for the remaining commodities, it tends to exhibit one of the highest volatilities. This observation is consistent with the findings reported by Milonas and Vora (1985) for the U.S. market.

Trading session effects can be examined by analyzing the ratios of average monthly variances of the logarithm of futures price relatives. These ratios are computed by using the open to open price relatives in the numerator and the close to close price relatives in the denominator. One can control for calendar time by computing the ratios in this way

Table IV
CALENDAR MONTH EFFECT: ANOVA TEST OF EQUALITY OF AVERAGE VARIANCES

Calendar Month	Average Monthly Variances $\times 10^{-3}$ Barley	Oats	Flaxseed	Rye	Feed Wheat	Canola
January	0.051	0.053	0.100	0.100	0.051	0.099
February	0.053	0.093	0.090	0.110	0.056	0.076
March	0.076	0.116	0.090	0.100	0.056	0.076
April	0.113	0.177	0.130	0.160	0.090	0.110
May	0.197	0.181	0.200	0.307	0.127	0.177
June	0.137	0.110	0.141	0.130	0.089	0.191
July	0.281	0.240	0.176	0.259	0.240	0.269
August	0.190	0.151	0.146	0.311	0.124	0.159
September	0.425	0.325	0.204	0.203	0.243	0.126
October	0.095	0.121	0.133	0.168	0.153	0.180
November	0.055	0.056	0.083	0.110	0.093	0.089
December	0.086	0.099	0.124	0.079	0.084	0.115
Grand mean	0.148	0.144	0.135	0.170	0.118	0.139
Obs.	89	89	89	89	89	89
DF	11/77	11/77	11/77	11/77	11/77	11/77
F stat.	1.83	1.15	1.12	2.55	2.15	1.979
P value	0.06	0.34	0.36	0.008	0.03	0.042

Table V
CONTRACT MONTH EFFECT: ANOVA TEST OF EQUALITY OF NORMALIZED AVERAGE VARIANCES

Contract Month	Normalized Average Variances Barley	Oats	Flaxseed	Rye	Feed Wheat	Canola
March	1.679	1.737	1.330	1.310	1.856	1.177
May	4.121	2.422	1.327	1.543	2.217	1.586
July	1.977	1.398	1.270	1.775	1.730	2.477
October	1.400	1.445	1.153	1.410	1.369	1.495
December	1.419	1.406	1.293	1.422	1.291	1.222
Grand mean	2.119	1.682	1.272	1.502	1.673	1.580
Obs.	40	40	38	38	37	37
DF	4/35	4/35	4/33	4/33	4/32	4/32
F stat.	4.05	2.08	0.45	1.12	1.96	0.94
P value	0.01	0.11	0.77	0.36	0.13	0.45

since both the numerator and the denominator then have the same time span. The second column of Table VI presents the results of these computations. As the table shows, the ratios have a value greater than one for all commodities indicating that opening prices are

Table VI
TRADING SESSION EFFECTS: RATIOS OF AVERAGE VARIANCES OF THE LOGARITHM OF PRICE RELATIVES

Commodities	$\frac{\sigma_o^2}{\sigma_c^2}$	$\frac{\sigma^2 M_{o-c}}{\sigma^2 F_c - M_c}$
Barley	1.32	0.479
Canola	1.16	6.389
Flaxseed	1.20	98.561
Oats	1.23	0.548
Rye	1.30	114.943
Feed wheat	1.23	0.634

Note: σ_o^2 : Average variances of $\ln(P_{ot}/P_{ot-1})$
σ_c^2 : Average variances of $\ln(P_{ct}/P_{ct-1})$
$\sigma^2 M_{o-c}$: Average variance of Monday $\ln(P_{ot}/P_{ct})$
$\sigma^2 F_c - M_c$: Average variance of $\ln(P_{c,\text{Friday}}/P_{c,\text{Monday}})$
P_o : Opening price
P_c : Closing Price

more volatile than closing prices. These findings are consistent with those of Lockwood and Lynn (1990) and of Stoll and Whaley (1990) with respect to stock market returns, and corroborate those of Jordan et al. (1988) for the U.S. soybean futures. As those authors have argued, these results could be explained by the release of private information thru trading and order imbalances at the opening session as well as by the absorption of public information accumulated during non-trading hours.

An alternative way to examine trading session effects is to compare for all business days the average daily variances of close to open prices when the exchange is closed, to open to close prices when it is open. The ratios of these variances are reported in Table VII. The numerator in these calculations is the close to open price change variance and represents the average futures price volatility during non-trading hours. The denominator is the variance calculated with the daily high and low prices. It represents the average variances during trading hours. In both cases, Parkinson's formula is applied to compute the variances.[8]

The ratios shown in Table VII are much lower than one for all commodities except feed wheat. Note that daily trading hours for grains at the Winnipeg Commodity Exchange are from 9:30 AM to 1:15 PM and are, therefore, much shorter than non-trading hours. These results reject the null hypothesis that variances of price relatives are the same on average per unit of time during trading and non-trading sessions and provide additional evidence that trading generates volatility, possibly because of private information and/or errors in prices induced by the trading activity itself.

Now, the average variance of Monday open to Monday close price relatives are compared to the average variance of Friday close to Monday close price relatives. The Monday open to Monday close price relatives should reflect public information flow during Monday trading session as well as the bulk of private information released thru trading. The Friday close to Monday close price relatives should reflect public information

[8]In computing the variance of the numerator, the open and close prices are used as the high and low in Parkinson's formula. This may underestimate the variance.

Table VII
TRADING SESSION EFFECTS: AVERAGE DAILY RATIOS OF $\sigma^2_{co}/\sigma^2_{oc}$

Commodity	Mean	Number of Observations
Barley	0.2744	6401
Canola	0.4772	6159
Feed wheat	2.8180	3705
Oats	0.2555	419
Flaxseed	0.1699	4472
Rye	0.1279	2590

Note: $\sigma^2_{oc} = \frac{(H - L)^2}{4\text{Ln}2}$

$\sigma^2_{co} = \frac{(C - O)^2}{4\text{Ln}2}$

where o: today's open price
c: previous day's close price
H: today's high price
L: today's low price

flow during the week-end and during Monday trading session plus private information released thru trading on Monday. Thus, a variance in the numerator larger than that of the denominator per unit of time could indicate that prices on Monday opening sessions reflect order imbalances as well as noise in private information released.[9] The results reported in the third column of Table VI tend to support this explanation. Indeed, for all commodities under study, the average variance of Monday open to Monday close is much larger than that of Friday close to Monday close.[10] The table also shows that the three commodities marketed entirely by private traders—namely, canola, flaxseed, and rye—exhibit much higher ratios than the other three commodities which are controlled by the Wheat Board. This observation provides additional support to the above explanation.

SUMMARY AND CONCLUSIONS

This article examines the determinants of non-stationarity of futures prices for six commodities traded at the Winnipeg Commodity Exchange. The empirical investigation focuses on the year, calendar month, contract month, maturity, and trading session effects for the period 1980–1988.

The general conclusion of the study is that the volatility of Winnipeg Commodity futures prices is influenced by the five determinants mentioned above. The evidence also shows that the intervention of the Wheat Board mainly cushions the year, maturity, and trading session effects for the three commodities under its control, but has no bearing on the month or contract effects. Apart from the mitigating effects of the Wheat Board intervention, the results indicate that futures price volatilities in Canadian markets are, by and large, comparable to those observed in U.S. markets.

[9]See Stoll and Whaley (1990) for a similar argument.
[10]Again, daily trading sessions at the Winnipeg Commodity Exchange last for only 3 hours and 45 minutes.

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