

Night's Watch

United Grain Growers Limited

Agenda

Introduction

Poison Pill

Earnings at Risk (EaR)

Weather Risk Hedging

Earnings Model

Conclusion

I. Company Overview

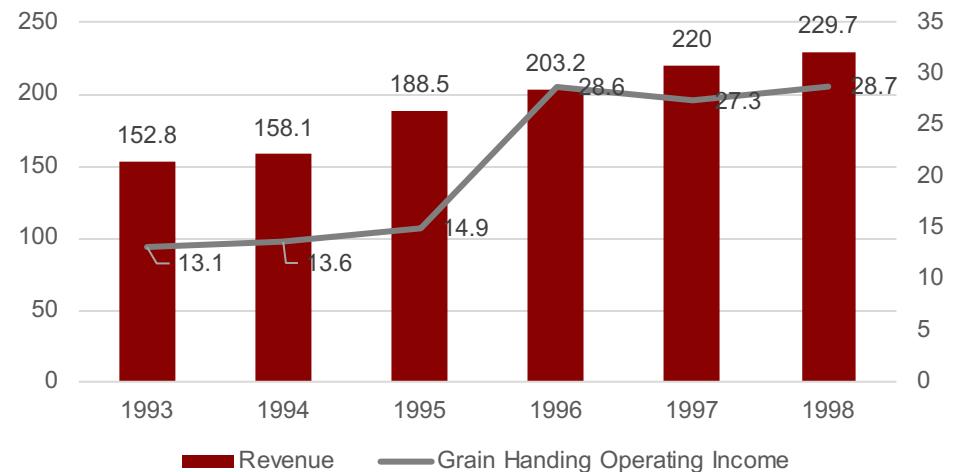
Company Overview

United Grain Growers Limited

- Canadian Grain Storage and Distribution company
- Established in 1960, IPO in 1993, ceased in 2001
- Business Division: Grain Handling, Crop Production Services, Livestock Services, Farm Business Communications, Corporate and Other



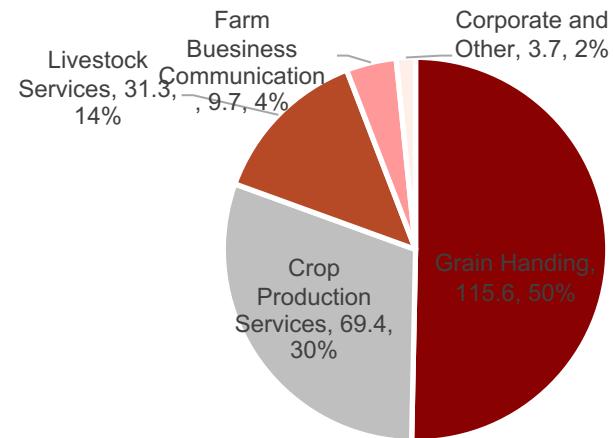
Earning and Operating Income from Grain Handling



Risks

- Environmental Liability – insurance/control
- Counterparty – diversification/due diligence/contracts
- Credit — diversification/due diligence/contracts
- Inventory – operational control
- Commodity – futures and options
- **Weather** – currently no method to manage it

Revenue by Business Division



II. Poison Pill

Poison Pill

Definition

- A defensive measure to against hostile take over
- "Shareholder Rights Plan" – shareholders can buy new issued shares at around 50% discount
- Non-complying share ownership bidder would be substantially diluted



Good or Bad

- Controversial issue – no common conclusion of how the market reacts to the adoption
- From a shareholder perspective, we believe it's good for them
 - UGG didn't want to be acquired
 - Successfully defend the bidders
 - Management has been acting in shareholders best interest



III. Earning at Risk Model

EaR Monte Carlo Simulation Model (1/3)

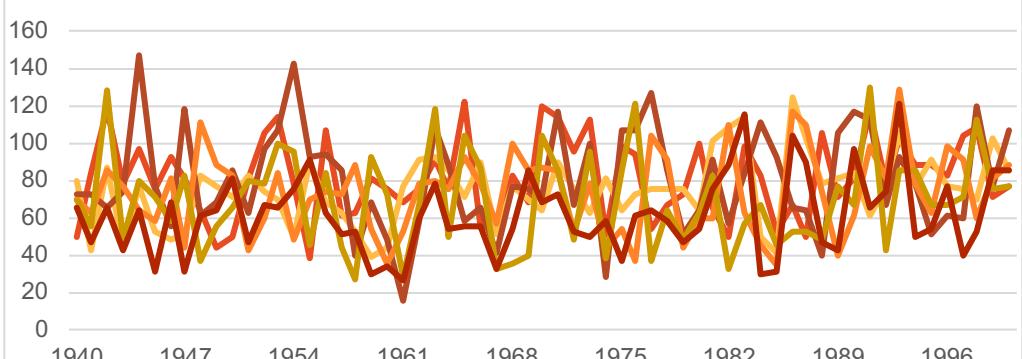
Component	Description	Distribution
June, July precipitation distribution	<ul style="list-style-type: none"> Based on 60 years June and July precipitation data in Alberta, Manitoba and Saskatchewan, the June, July precipitation distributions are generated. 	<ul style="list-style-type: none"> June precipitation $\sim N(76.68, 19.71^2)$ July precipitation $\sim N(69.68, 17.31^2)$
Feb, Sep average temperature distribution	<ul style="list-style-type: none"> Based on 60 years Feb and Sep average temperature data in Alberta, Manitoba and Saskatchewan, the Feb, Sep temperature distributions are generated. 	<ul style="list-style-type: none"> Feb temperature $\sim N(-12.62, 4.19^2)$ Sep temperature $\sim N(10.75, 1.68^2)$

EaR Monte Carlo Simulation Model (2/3)

Weather-to-Yield
Model

- Based on 40 years yield and weather data (June, July precipitation and Feb, Sep Temperature data), generate the linear regression model.

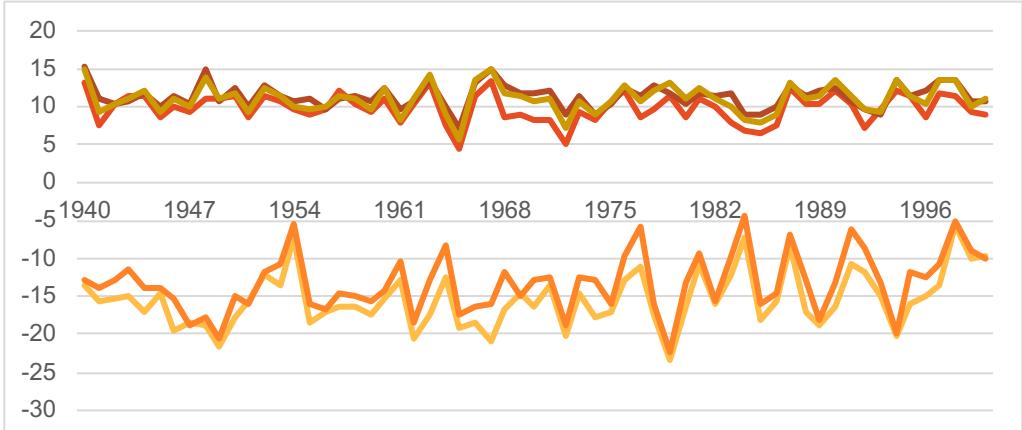
$$\text{Yield} = 200.4 + 4.48 * \text{Precipitation_Jun} + 6.36 * \text{Precipitation_Jul} - 2.84 * \text{Temperature_Feb} + 10 * \text{Temperature_Sep} + 21.57 * \text{Time}$$



Yield-to-Earning
Model

- Based on Grain Handling Income and Yield data from 1993 to 1998, generate the linear regression model.

$$\text{Grain-handling-Earning} = -55.42 + 0.033 * \text{Yield}$$

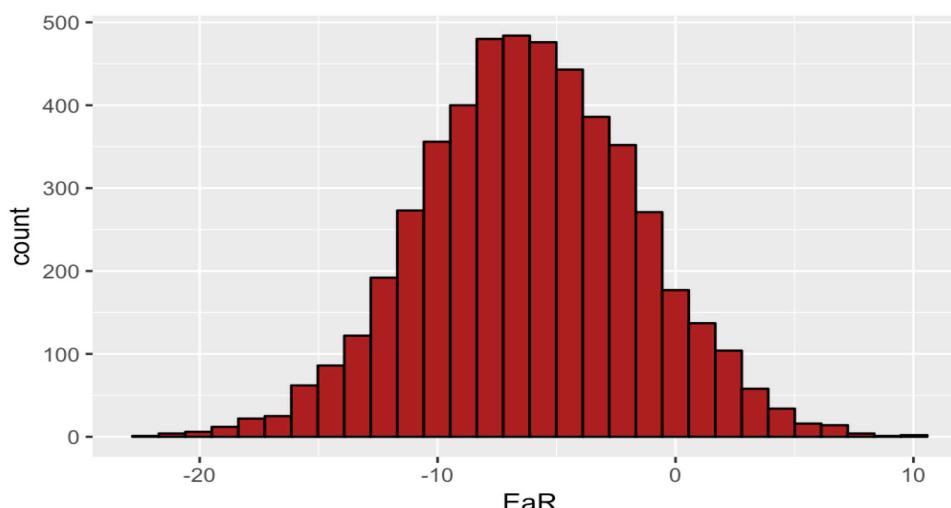


EaR Monte Carlo Simulation Model (3/3)

5000 Monte Carlo Scenarios



1999 Earning at Risk -\$17MM



Model Assumptions

1. Type one

- The model must work reasonably with only 40 years of historical weather-yield observed data.
- The model must work reasonably with only 6 years of historical yield-income observed data.
- The model must work with yearly data.

2. Type two

- The model must work with the assumption that time-related factors, such as technological development, improved by constant every year which could be explained by the time-relative term in Weather-to-Yield Model.
- The model must work reasonably with the assumption that the sum of total yields in Alberta , Manitoba and Saskatchewan is very approximate to total yields in Canada.
- The model must work reasonably with the assumption that the Operating income of Crop Production Services, Livestock Services, Farm Business Communications, and Corporate and Other are constant over years

3. Type Three

- The 5000 simulation scenarios should be implemented independently to guarantee the model correctness.

IV. Hedging Strategy

Futures or Options

3-Month hedging horizon – Calculated from turn over ratio



Lock-in Profits and Hedging Cost

300 MM corn and 200 MM wheat

- Lock-in Profits : Guarantee selling prices at \$3.82/bushel wheat and \$5.21/bushel corn – lock in 300MM revenue from corn and 200MM from wheat
- Hedging Cost: If prices go up, losses in future contracts will offset some revenue.

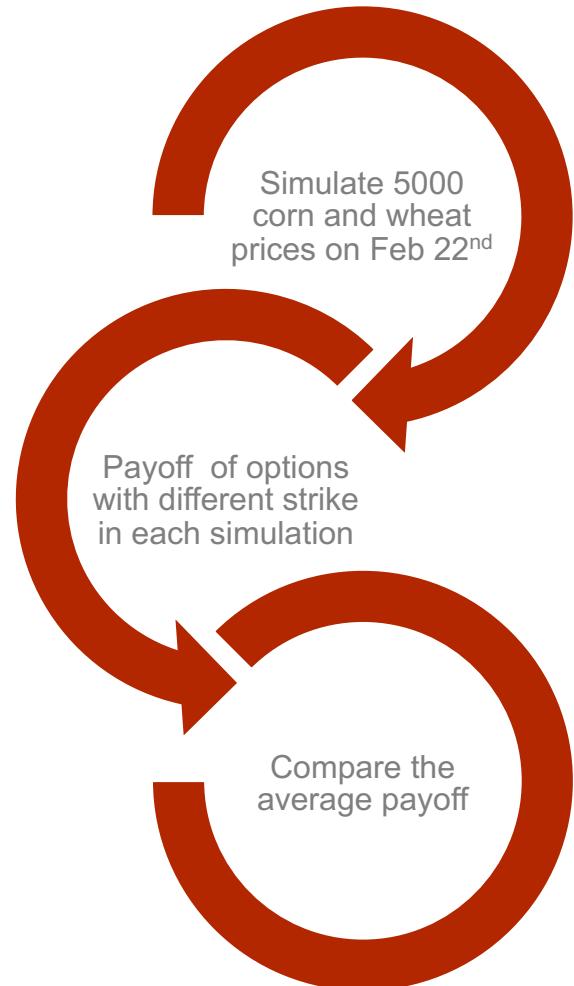
Lock-in Profits and Hedging Cost

- Lock-in Profits : Guarantee selling prices at actual prices on Feb 22nd
- Hedging Cost: If prices go up, losses in future contracts will offset some revenue. Premium needed to buy options

Simulation on Corn and Wheat prices

5000 simulations on price paths to find the most efficient strategy

Random-walk-with-drift based on 40-year historical prices



Strike Price	Option Price	Avg. Profits	Strike Price	Option Prices	Avg. Profits
460	1.25	204.88	320	0.125	300.00
465	1.75	205.58	325	0.25	300.00
470	2.375	206.36	330	0.25	300.00
475	3.125	207.24	335	0.375	300.00
480	4	208.20	340	0.5	300.00
485	5.125	209.27	345	0.75	299.99
490	6.5	210.43	350	1	299.99
495	8.125	211.69	355	1.5	299.98
500	9.875	213.06	360	2.25	299.97
505	12	214.55	365	3.375	299.95
510	14.375	216.16	370	5	299.93
515	16.875	217.90	375	7	299.90
520	19.625	219.77	380	9.375	299.99
525	22.625	221.74	385	12.25	302.21
530	25.75	223.83	390	15.5	306.04
535	29.125	226.03	395	19.125	309.91
540	32.625	228.34	400	23	313.77
545	36.25	230.76	405	27	317.64
550	40	233.29	410	31.25	321.50
555	43.875	235.93	415	35.5	325.36
560	47.875	238.69	420	40	329.21
565	51.875	241.55	425	44.625	333.07
570	56.125	244.51	430	49.25	336.92
575	60.375	247.56	435	54	340.77
580	64.625	250.69	440	58.875	344.63

V. Earning Model

94% Variability Explained

94% is the coefficient of determination, which is a key output of regression model analysis.



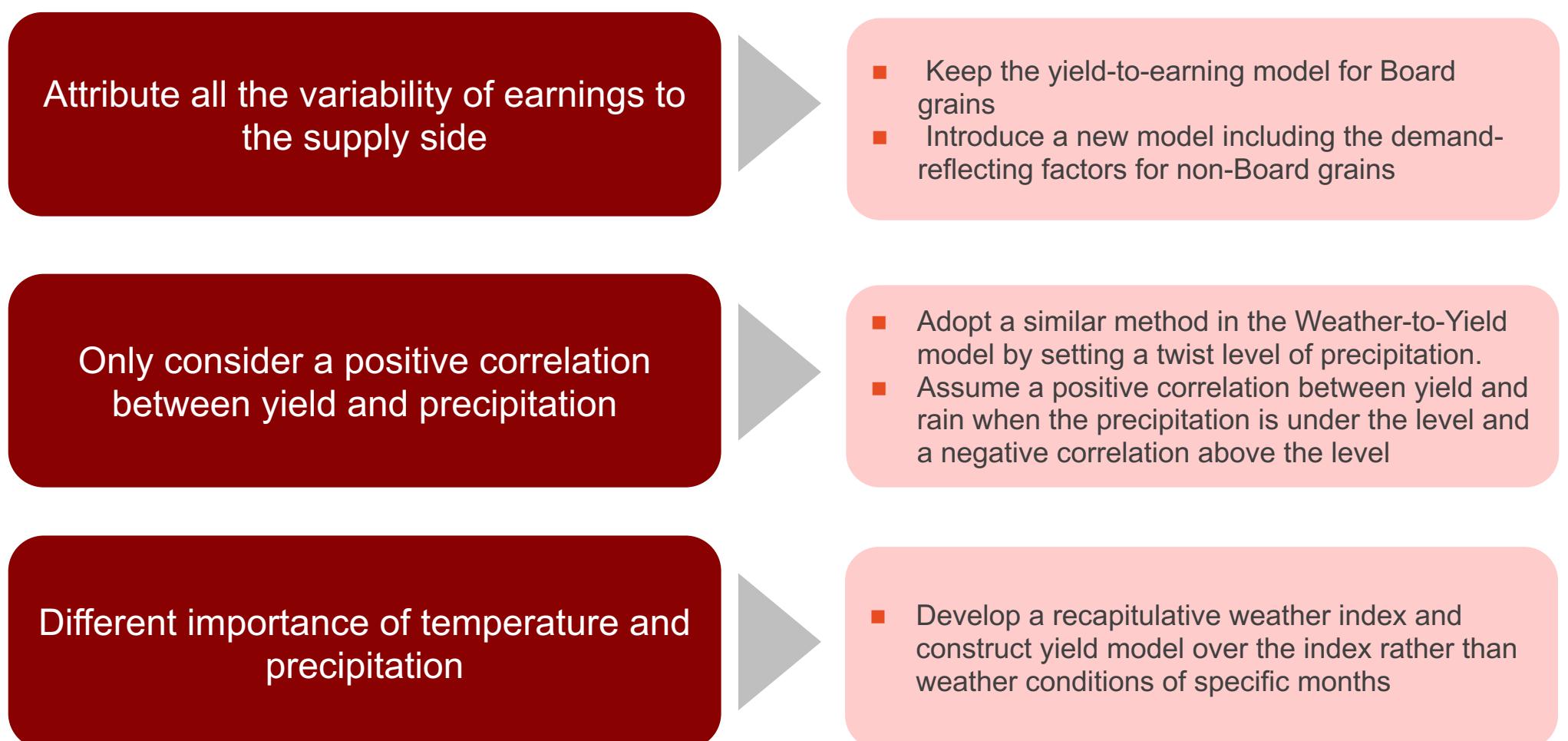
94% explainable by yield

Coefficient of Determination (R – square)

- The square of the correlation between model's predicted earning and actual earning
- It ranges from 0 to 1
- $R - \text{square} = 94\%$ indicates that 94% variance in *earning* is predictable from *yield*

It is **reasonable** to predict earning by yield

Pitfalls and Improvements



Conditions of Unlimited-protection Insurance

Rating System

- Develop a historical database of weather conditions and categorize farms by certain standards (productivity, variation of weather, etc) and set different insurance contracts for farms of different rating

Concerns Relieved by the Condition

Moral Hazard

Dynamic Standard

- Link sum insured to national / regional average yield

Weather Risk

Diversified Customers

- Set compulsory clause in the contract to make sure that the insurance covers all the farms under UGG

Biased Selection

Economic Shock

VII. Conclusion

Conclusion

Risk Management



Earnings at Risk (EaR)

- The Weather-To-Yield Model and Yield-To-Earning Model
- 5000 risk scenarios are generated
- All factors are consolidated into Monte Carlo Simulation



Manage Weather Risk

- Use industry grain handling volume instead of firm's own volume to avoid moral hazard problem



Takeaways



Management

- Management needs to act in shareholders best interest
- Forward looking and strategic alliance



Hedging

- Effective hedging strategy to protect the downside risk



Thorough Research

- Analyze historical data to better understand which variables could affect earnings



Risk Mitigation

- Consolidated risk management framework to take advantage of diversification

Appendix

Appendix

Weather to Yield regression summary

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.9328313							
R Square	0.87017423							
Adjusted R Square	0.85837188							
Standard Error	177.159473							
Observations	61							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	5	11570090.19	2314018	73.72894	3.93115E-23			
Residual	55	1726201.339	31385.48					
Total	60	13296291.53						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	200.421227	228.0758093	0.878748	0.383361	-256.6529093	657.495363	-256.652909	657.4953625
Precipitation - Jun	4.47982785	1.225864815	3.654422	0.000577	2.023139861	6.93651584	2.023139861	6.936515835
Precipitation - Jul	6.35793258	1.397169795	4.55058	3E-05	3.557941741	9.15792342	3.557941741	9.15792342
Temperature - Feb	-2.83566218	6.703378573	-0.42302	0.67393	-16.26953304	10.5982087	-16.269533	10.59820868
Temperature - Sep	9.99726945	13.68738467	0.7304	0.468245	-17.43286239	37.4274013	-17.4328624	37.42740129
Time	21.5692597	1.401035431	15.39523	1.36E-21	18.76152196	24.3769975	18.76152196	24.37699745

Appendix

Yield to Earning model regression summary

SUMMARY OUTPUT								
Regression Statistics								
Multiple R	0.516766582							
R Square	0.2670477							
Adjusted R Squa	0.083809625							
Standard Error	7.550351535							
Observations	6							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	1	83.08210011	83.0821	1.457381	0.293850791			
Residual	4	228.0312332	57.00781					
Total	5	311.1133333						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-55.42066704	63.40557658	-0.87407	0.431421	-231.4627698	120.6214357	-231.4627698	120.6214357
Yield	0.032463082	0.026890767	1.20722	0.293851	-0.042197656	0.107123819	-0.042197656	0.107123819

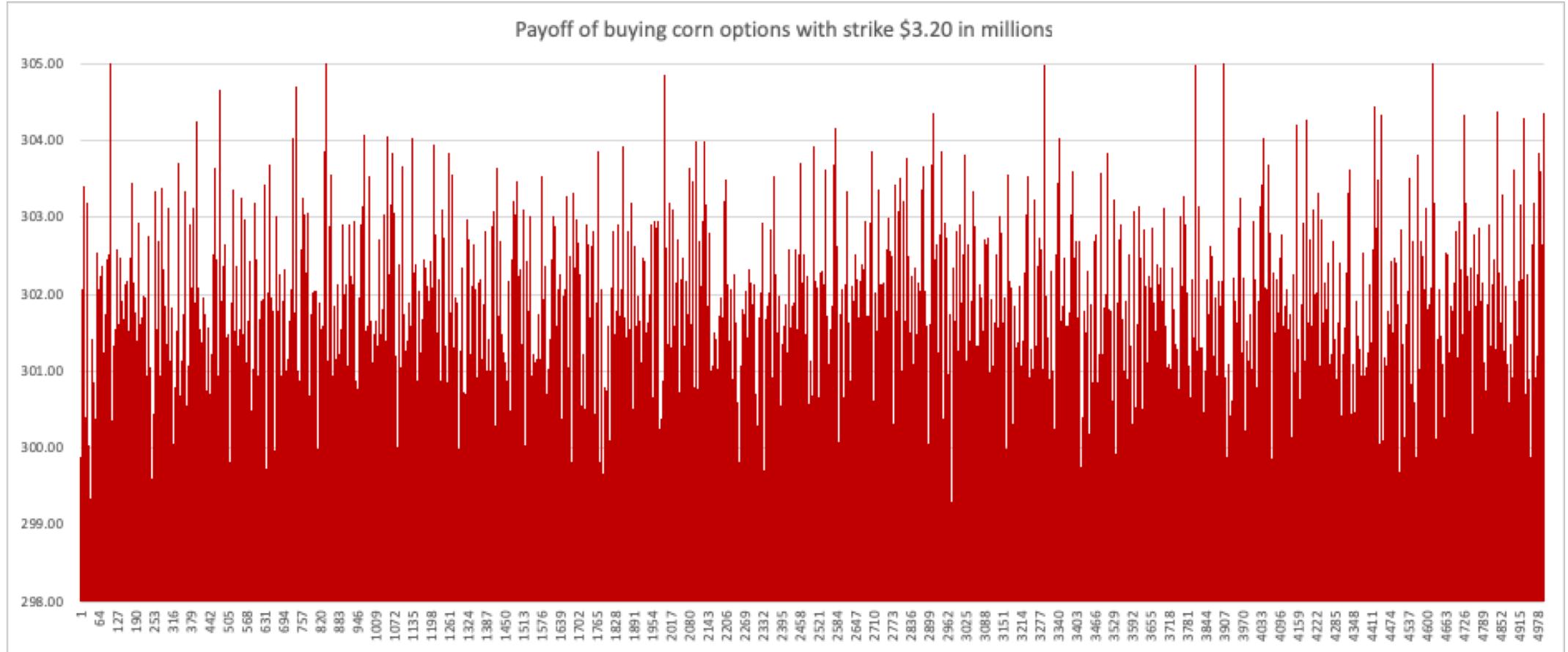
Appendix

Average Payoff of Corn and wheat options

Corn put options strike	Corn put options price on Dec 3rd	# of times that payoff > 300mn in simulations	Average payoff	Wheat put options strike	Wheat put options price on Dec 3rd	# of times that payoff > 200mn in simulations	Average payoff
320	0.125	2,487	300,004,809.81	460	1.25	2,656	204,876,493
325	0.25	2,485	300,002,846.45	465	1.75	2,716	205,577,893
330	0.25	2,485	300,002,846.45	470	2.375	2,792	206,363,280
335	0.375	2,485	300,000,883.10	475	3.125	2,906	207,237,385
340	0.5	2,482	299,998,919.75	480	4	3,004	208,204,276
345	0.75	2,478	299,994,993.05	485	5.125	3,153	209,269,144
350	1	2,473	299,991,066.35	490	6.5	3,330	210,426,782
355	1.5	2,467	299,983,212.95	495	8.125	3,543	211,688,147
360	2.25	2,455	299,971,432.84	500	9.875	3,780	213,061,147
365	3.375	2,434	299,953,762.68	505	12	4,019	214,549,770
370	5	2,405	299,928,239.12	510	14.375	4,290	216,159,288
375	7	2,366	299,896,899.87	515	16.875	4,597	217,898,005
380	9.375	2,320	299,992,990.52	520	19.625	4,918	219,768,241
385	12.25	5,000	302,211,736.49	525	22.625	5,000	221,744,454
390	15.5	5,000	306,039,338.38	530	25.75	5,000	223,829,221
395	19.125	5,000	309,909,031.41	535	29.125	5,000	226,028,408
400	23	5,000	313,774,869.11	540	32.625	5,000	228,338,917
405	27	5,000	317,638,743.46	545	36.25	5,000	230,756,623
410	31.25	5,000	321,498,691.10	550	40	5,000	233,286,946
415	35.5	5,000	325,358,638.74	555	43.875	5,000	235,931,852
420	40	5,000	329,214,659.69	560	47.875	5,000	238,686,151
425	44.625	5,000	333,068,717.28	565	51.875	5,000	241,547,249
430	49.25	5,000	336,922,774.87	570	56.125	5,000	244,506,778
435	54	5,000	340,774,869.11	575	60.375	5,000	247,557,114
440	58.875	5,000	344,625,000.00	580	64.625	5,000	250,690,848

Appendix

Example of corn option with strike \$3.2/bushel payoff in 5000 simulations



Appendix

Example of wheat option with strike \$4.6/bushel payoff in 5000 simulations

