



Working with Your Data (using Excel)



Kevin Dhuyvetter, Ph.D.
 Dept. of Ag. Economics
 Kansas State University
 785.532.3527 -- kcd@ksu.edu

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Working with Your Data

- Organizing data and looking for outliers
 - No one method is always best for organizing data, generally suggested to use a separate row in the spreadsheet for each observation (e.g., animal, lot, pen).
 - Sorting data based upon a particular characteristic (e.g., year, pen, owner) may be helpful.
 - Because data sets can be quite large, often easiest to look for outliers using summary statistics and graphs (i.e., you can't "look" at every observation in many cases).



Working with Your Data

- Analyzing your data in Excel – summary statistics, histograms, trendlines, etc.
 - There are many different methods of analyzing data. We are going to focus on just a few of the tools that can be used in Excel for data analysis.
 - Spreadsheets such as Excel are extremely powerful tools for analyzing data. However, for very large datasets that will likely emerge with individual animal ID, spreadsheets will have some limitations.
 (e.g., BeefBasis project: Access → SAS → Matlab → SAS → Lotus → Excel)



Excel: Tools/Data Analysis...

- Anova: Single Factor
- Anova: Two-Factor with Replication
- Anova: Two-Factor without Replication
- Correlation
- Covariance
- Descriptive Statistics
- Exponential Smoothing
- F-Test: Two-Sample for Variance
- Fourier Analysis
- Histogram



Excel: Tools/Data Analysis...

- Moving Average
- Random Number Generation
- Rank and Percentile
- **Regression**
- Sampling Covariance
- t-Test: Paired Two Sample for Means
- **t-Test: Two-Sample (equal variances)**
- **t-Test: Two-Sample (unequal variances)**
- z-Test: Two-Sample for Means
-
- **Pivot table**



Example data sets for analysis

- **Historical calving records for cow herd based on cows that calved in 2004.**
- **Backgrounding vaccination trial conducted in the fall of 2003.**

Keep in mind these are only examples to show some of the possibilities of analyzing data where it exists on individual animals.



Cow herd data ...

- Cow and calf ID
- Cow age
- Sex of calf (1=bull, 2=heifer, 3=steer)
- Calf birth date and weight
- Calf weaning weight and date
- Sire ID
- Cow condition
- Cow weight
- Other (breed, frame, mgmt, etc.)

Potential data problems?



Data as I received it
(also received a Word file with explanations)

From a spreadsheet perspective, are there any organizational problems?

Row	Animal ID	Date	Weight	Condition	Other
1	ES010	9 AN	100.49	8	7 370 127
2	7061	2 02/21/1997	72	314	417 93
3	8148	2 03/15/1998	82	500	548 94
4	8028	3 02/27/1999	92	642	594 97
5	0014	2 02/18/2000	86	646	590 K
6	1244	3 03/18/2001	112	780	677 105 0
7	2044	2 02/22/2002	102	734	634 0
8	N3178	3 03/19/2003	106	714	628 116 0
9	P4160	3 03/25/2004	85	0	0
10	erage	92	616	578	101 4.94 2.22 2.62
11	ES013	9 AN	104.33		
12	6330	1 11/30/1996	58		
13	8129	2 03/06/1998	93		
14	9081	2 03/05/1999	91		
15	KM11	0 01/01/2000			
16	1087	2 02/23/2001	80		
17	2240	3 03/18/2002	116		
18	N3185	3 03/20/2003	114		
19	P4146	2 03/23/2004	82		
20	erage	91	610		
21	ES025	9 AN	103.58	8	7 388 127
22	6321	1 11/09/1996	54	426	361 90
23	8145	2 03/15/1998	68	538	596 100
24	9175	2 03/28/1999	96	574	619 101
25	0060	2 02/24/2000	89	606	526 98
26	1133	2 02/25/2001	89	786	680 110 0
27	2256	3 03/20/2002	102	708	637 115 0
28	N3153	2 03/14/2003	90	682	617 117 0
29	P4230	3 04/19/2004	102	0	0 5.23 2.23 2.58
30	erage	86	617	575	104 7 368 127
31	ES036	9 AN	101.22	8	7 368 127
32	7266	3 04/07/1997	70	248	394 94
33	8141	2 03/13/1998	78	530	574 98
34	9152	2 03/20/1999	89	564	592 97
35	0118	3 03/01/2000	102	640	541 100
36	1261	3 03/20/2001	106	758	680 108 0

CowherdNov(2011).xls [Compatibility Mode] - Microsoft Excel

"Cleaned up" data

Various summary statistics calculated
(help identify potential problems as well as provide useful information)

1	A	B	C	D	E	F	G	H	I	J	K	L	O	P	Q	R	U	V	W	X
2		Cowherd data																		
3	Average	#DIV/0!	5.18	#DIV/0!	#DIV/0!	2.46	37454.43	2002.32	86.74	542.23	548.33	4.65	#DIV/0!	1.77	2.42	#DIV/0!	5.06	1196.40		
4	Min	0	1	0	0	0	35378.1996	5	188	292.03	1.70	#DIV/0!	-0.53	1.25	0	2.00	822.00			
5	Max	0	0	0	0	3	38103.2004	132	846	737.16	6.80	#DIV/0!	3.00	3.47	0	8.00	1565.00			
6	Std dev	#DIV/0!	2.00	#DIV/0!	#DIV/0!	0.58	611.59	1.71	14.34	119.35	72.82	0.98	#DIV/0!	0.83	0.41	#DIV/0!	0.98	140.23		
7	Count	0	802	0	802	802	802	802	789	545	543	176	540	607	545	0	440	441		
8	CountA	802	802	802	802	802	789	545	543	176	540	607	545	0	440	441				

11	Obs	Cow ID	Age	Breed	Call ID	Sex	Year	Birth date	Act WW	Adj WW	Frame	Wean date	ADG	WDA	See ID	Cow cond	Cow wt			
12	1	E5010	9	AN	7051	2	02/21/97	1997	72	311	417	3.50	08/23/97	1.32	1.72	1.32				
13	2	E5010	9	AN	1148	2	03/15/98	1998	82	500	548	4.50	10/13/98	1.97	2.36	MESS	6	1.270		
14	3	E5010	9	AN	9028	3	02/27/99	1999	92	642	594	5.50	10/19/99	2.35	2.74	144	7	1.385		
15	4	E5010	9	AN	7014	2	02/18/00	2000	86	646	550	5.70	11/06/00	2.14	2.47	SKOG	5	1.320		
16	5	E5010	9	AN	1240	3	03/18/01	2001	112	760	677	5.50	11/08/01	2.76	3.23	SR110	5	1.470		
17	6	E5010	9	AN	1240	3	03/18/01	2001	112	760	677	5.50	11/08/01	2.76	3.23	SR110	5	1.470		
18	7	E5010	9	AN	13178	3	03/19/03	2003	106	714	628	5.50	11/13/03	2.54	2.99	TAN221	5	1.270		
19	8	E5010	9	AN	P1600	3	03/25/04	2004	85			n/a			HP95					
20	9	E5013	9	AN	5330	1	11/30/96	1996	58	512	445	08/23/97	1.71	1.92	3FSM					
21	10	E5013	9	AN	8129	2	03/08/98	1998	93	636	669	6.10	10/13/98	2.48	2.90	MESS	6	1.370		
22	11	E5013	9	AN	9061	2	03/06/99	1999	91	578	574	4.90	10/20/99	2.14	2.54	T41	8	1.435		
23	12	E5013	9	AN	KM11	0	01/10/00	2000	n/a			n/a			UNKN					
24	13	E5013	9	AN	1087	2	02/23/01	2001	80	610	530	4.80	11/06/01	2.07	2.38	T11	6	1.540		
25	14	E5013	9	AN	7240	3	03/18/02	2002	116	625		11/06/02	2.18	2.68	UNKNHH	5	1.420			
26	15	E5013	9	AN	13185	3	03/20/03	2003	114	700	619	11/13/03	2.46	2.94	UNKNLO	6	1.380			
27	16	E5013	9	AN	P1446	2	03/23/04	2004	82			n/a			HP95					
28	17	E5025	9	AN	5321	1	11/09/96	1996	54	426	361	08/23/97	1.30	1.48	3FSM					
29	18	E5025	9	AN	1145	2	03/15/98	1998	68	538	586	4.90	10/13/98	2.22	2.54	MESS	6	1.390		
30	19	E5025	9	AN	1175	2	03/28/99	1999	96	574	619	5.50	10/20/99	2.32	2.79	S032	6	1.400		
31	20	E5025	9	AN	9060	2	02/24/00	2000	89	605	526	4.80	11/07/00	2.01	2.36	HP85	6	1.385		
32	21	E5025	9	AN	1133	2	02/25/01	2001	89	786	680	5.70	11/08/01	2.72	3.07	HP6	5	1.565		
33	22	E5025	9	AN	2256	3	03/20/02	2002	102	708	637	11/07/02	2.61	3.05	UNKNHH	6	1.460			
34	23	E5025	9	AN	13153	2	03/14/03	2003	90	682	617	11/13/03	2.43	2.80	TAN212	4	1.280			
35	24	E5025	9	AN	P4230	3	04/19/04	2004	102			n/a			UNKNHH					
36	25	E5036	9	AN	7056	1	04/07/97	1997	70	248	394	2.60	08/23/97	1.29	1.80	WHIT				
37	26	E5036	9	AN	1141	2	03/13/98	1998	78	530	574	5.40	10/13/98	2.11	2.48	MESS	6	1.186		
38	27	E5036	9	AN	1152	2	03/20/99	1999	89	564	592	4.60	10/19/99	2.23	2.65	MESS	6	1.330		
39	28	E5036	9	AN	1118	3	03/01/00	2000	102	640	541	4.80	11/07/00	2.14	2.55	HP96	5	1.290		
40	29	E5036	9	AN	1261	3	03/20/01	2001	106	758	680	5.60	11/08/01	2.80	3.25	LP6	6	1.500		
41	30	E5036	9	AN	1140	3	03/03/02	2002	84	622	563	11/07/02	2.16	2.50	UNKNHH	7	1.430			

CowherdNov(2011).xls [Compatibility Mode] - Microsoft Excel

"Cleaned up" data

Summary statistic formula

=AVERAGE(D32:D5000)

1	A	B	C	D	E	F	G	H	I	J	K	L	O	P	Q	R	U	V	W	X
2		Cowherd data																		
3	Average	#DIV/0!	5.18	#DIV/0!	#DIV/0!	2.46	37454.43	2002.32	86.74	542.23	548.33	4.65	#DIV/0!	1.77	2.42	#DIV/0!	5.06	1196.40		
4	Min	0	1	0	0	0	35378.1996	5	188	292.03	1.70	#DIV/0!	-0.53	1.25	0	2.00	822.00			
5	Max	0	0	0	0	3	38103.2004	132	846	737.16	6.80	#DIV/0!	3.00	3.47	0	8.00	1565.00			
6	Std dev	#DIV/0!	2.00	#DIV/0!	#DIV/0!	0.58	611.59	1.71	14.34	119.35	72.82	0.98	#DIV/0!	0.83	0.41	#DIV/0!	0.98	140.23		
7	Count	0	802	0	802	802	802	802	789	545	543	176	540	607	545	0	440	441		
8	CountA	802	802	802	802	802	789	545	543	176	540	607	545	0	440	441				

11	Obs	Cow ID	Age	Breed	Call ID	Sex	Year	Birth date	Act WW	Adj WW	Frame	Wean date	ADG	WDA	See ID	Cow cond	Cow wt			
12	1	E5010	9	AN	7051	2	02/21/97	1997	72	314	417	3.50	08/23/97	1.32	1.72	1.32				
13	2	E5010	9	AN	1148	2	03/15/98	1998	82	500	548	4.50	10/13/98	1.97	2.36	MESS	6	1.270		
14	3	E5010	9	AN	9028	3	02/27/99	1999	92	642	594	5.50	10/19/99	2.35	2.74	144	7	1.385		
15	4	E5010	9	AN	7014	2	02/18/00	2000	86	646	550	5.70	11/06/00	2.14	2.47	SKOG	5	1.320		
16	5	E5010	9	AN	1240	3	03/18/01	2001	112	760	677	5.50	11/08/01	2.76	3.23	SR110	5	1.470		
17	6	E5010	9	AN	1240	3	03/18/01	2001	112	760	677	5.50	11/08/01	2.76	3.23	SR110	5	1.470		
18	7	E5010	9	AN	13178	3	03/19/03	2003	106	714	628	5.50	11/13/03	2.54	2.99	TAN221	5	1.270		
19	8	E5010	9	AN	P1600	3	03/25/04	2004	85			n/a			HP95					
20	9	E5013	9	AN	5330	1	11/30/96	1996	58	512	445	08/23/97	1.71	1.92	3FSM					
21	10	E5013	9	AN	8129	2	03/08/98	1998	93	636	669	6.10	10/13/98	2.48	2.90	MESS	6	1.370		
22	11	E5013	9	AN	9061	2	03/06/99	1999	91	578	574	4.90	10/20/99	2.14	2.54	T41	8	1.435		
23	12	E5013	9	AN	KM11	0	01/10/00	2000	n/a			n/a			UNKN					
24	13	E5013	9	AN	1087	2	02/23/01	2001	80	610	530	4.80	11/06/01	2.07	2.38	T11	6	1.540		
25	14	E5013	9	AN	7240	3	03/18/02	2002	116	625		11/06/02	2.18	2.68	UNKNHH	5	1.420			
26	15	E5013	9	AN	13185	3	03/20/03	2003	114	700	619	11/13/03	2.46	2.94	UNKNLO	6	1.380			
27	16	E5013	9	AN	P1446	2	03/23/04	2004	82			n/a			HP95					
28	17	E5025	9	AN	5321	1	11/09/96	1996	54	426	361	08/23/97	1.30	1.48	3FSM					
29	18	E5025	9	AN	1145	2	03/15/98	1998	68	538	586	4.90	10/13/98	2.22	2.54	MESS	6	1.390		
30	19	E5025	9	AN	1175	2	03/28/99	1999	96	574	619	5.50	10/20/99	2.32	2.79	S032	6	1.400		
31	20	E5025	9	AN	9060	2	02/24/00	2000	89	605	526	4.80	11/07/00	2.01	2.36	HP85	6	1.385		
32	21	E5025	9	AN	1133	2	02/25/01	2001	89	786	680	5.70	11/08/01	2.72	3.07	HP6	5	1.565		
33	22	E5025	9	AN	2256	3	03/20/02	2002	102	708	637	11/07/02	2.61	3.05	UNKNHH	6	1.460			
34	23	E5025	9	AN	13153	2	03/14/03	2003	90	682	617	11/13/03	2.43	2.80	TAN212	4	1.280			
35	24	E5025	9	AN	P4230	3	04/19/04	2004	102			n/a			UNKNHH					
36	25	E5036	9	AN	7056	1	04/07/97	1997	70	248	394	2.60	08/23/97	1.29	1.80	WHIT				
37	26	E5036	9	AN	1141	2	03/13/98	1998	78	530	574	5.40	10/13/98	2.11	2.48	MESS	6	1.186		
38	27	E5036	9	AN	1152	2	03/20/99	1999	89	564	592	4.60	10/19/99	2.23	2.65	MESS	6	1.330		
39	28	E5036	9																	

"Cleaned up" data

Obs	Cow ID	2004	Age	Breed	Call ID	Sex	1=Bull, 2=Heifer, 3=Steer	Year	Birth wt	Act WW	ADG	WDA	Site ID	Cow cond	Cow wt
1	E5010	9	AN	7051	2	02/21/97	1	1997	72	500	1.32	172	132	1,172	
2	E5010	9	AN	7148	2	03/15/98	2	1998	82	500	1.22	158	132	1,172	
3	E5010	9	AN	9028	3	02/27/99	1999	92	642	594	5.50	10/19/99	2.35	274	144
4	E5010	9	AN	7014	2	02/18/00	2000	86	646	550	5.70	11/06/00	2.14	247	SKOG
5	E5010	9	AN	7240	3	03/18/01	2001	112	760	677	5.50	11/08/01	2.76	323	SR110
6	E5010	9	AN	7044	2	02/22/02	2002	102	734	634	6.00	11/07/02	2.45	284	SR34
7	E5010	9	AN	103178	3	03/19/03	2003	106	714	628	6.11	11/13/03	2.54	299	TAN221
8	E5010	9	AN	P4160	3	03/25/04	2004	85	n/a	n/a	n/a	n/a	n/a	n/a	HP95
9	E5013	9	AN	7330	1	11/30/96	1996	58	512	445	0.83	08/23/97	1.71	192	3F5M
10	E5013	9	AN	7129	2	03/08/98	1998	93	636	669	6.10	10/13/98	2.48	290	MESS
11	E5013	9	AN	7001	2	03/06/99	1999	91	578	574	4.90	10/20/99	2.14	254	T41
12	E5013	9	AN	KM11	0	01/01/00	2000	n/a	n/a	n/a	n/a	n/a	n/a	n/a	UNKN
13	E5013	9	AN	n/a	n/a	02/07/00	2000	2.07	238	211	6.15	10/01/00	2.07	238	T11
14	E5013	9	AN	n/a	n/a	02/07/00	2000	2.18	268	UNKN	6.14	10/01/00	2.18	268	UNKN
15	E5013	9	AN	n/a	n/a	02/07/00	2000	2.46	294	UNKN	6.13	10/01/00	2.46	294	UNKN
16	E5013	9	AN	n/a	n/a	02/07/00	2000	2.95	n/a	n/a	n/a	n/a	n/a	n/a	HP95
17	E5025	9	AN	7021	1	11/09/96	1996	94	426	391	1.30	08/23/97	1.30	148	3F5M
18	E5025	9	AN	7145	2	03/15/98	1998	68	538	586	4.90	10/13/98	2.22	254	MESS
19	E5025	9	AN	7175	2	03/26/99	1999	96	574	619	5.50	10/20/99	2.32	279	S032
20	E5025	9	AN	7060	2	02/24/00	2000	89	605	526	4.80	11/07/00	2.01	236	HH55
21	E5025	9	AN	7133	2	02/25/01	2001	89	786	680	5.70	11/08/01	2.72	307	796
22	E5025	9	AN	7256	3	03/20/02	2002	102	708	637	6.11	11/07/02	2.61	305	UNKN
23	E5025	9	AN	7153	2	03/14/03	2003	90	682	617	6.11	11/13/03	2.43	280	TAN212
24	E5025	9	AN	P4230	3	04/19/04	2004	102	n/a	n/a	n/a	n/a	n/a	n/a	UNKN
25	E5036	9	AN	7266	3	04/07/07	2007	70	248	394	2.60	08/23/97	1.29	180	WHT
26	E5036	9	AN	7141	2	03/13/98	1998	78	530	574	5.40	10/13/98	2.11	248	MESS
27	E5036	9	AN	7152	2	03/20/99	1999	89	564	592	4.60	10/19/99	2.23	265	MESS
28	E5036	9	AN	7118	3	03/01/00	2000	102	640	541	4.80	11/07/00	2.14	255	HP96
29	E5036	9	AN	7261	3	03/20/01	2001	106	758	680	5.60	11/08/01	2.80	325	L26
30	E5036	9	AN	7140	2	03/03/02	2002	84	622	563	6.11	11/07/02	2.16	250	UNKN

What does this 0 mean?

Do you notice any outliers?

"Cleaned up" data

Obs	Cow ID	2004	Age	Breed	Call ID	Sex	1=Bull, 2=Heifer, 3=Steer	Year	Birth wt	Act WW	ADG	WDA	Site ID	Cow cond	Cow wt
1	E5010	9	AN	7051	2	02/21/97	1997	72	500	1.32	172	132	1,172		
2	E5010	9	AN	7148	2	03/15/98	1998	82	500	1.22	158	132	1,172		
3	E5010	9	AN	9028	3	02/27/99	1999	92	642	594	5.50	10/19/99	2.35	274	144
4	E5010	9	AN	7014	2	02/18/00	2000	86	646	550	5.70	11/06/00	2.14	247	SKOG
5	E5010	9	AN	7240	3	03/18/01	2001	112	760	677	5.50	11/08/01	2.76	323	SR110
6	E5010	9	AN	7044	2	02/22/02	2002	102	734	634	6.00	11/07/02	2.45	284	SR34
7	E5010	9	AN	103178	3	03/19/03	2003	106	714	628	6.11	11/13/03	2.54	299	TAN221
8	E5010	9	AN	P4160	3	03/25/04	2004	85	n/a	n/a	n/a	n/a	n/a	n/a	HP95
9	E5013	9	AN	7330	1	11/30/96	1996	58	512	445	0.83	08/23/97	1.71	192	3F5M
10	E5013	9	AN	7129	2	03/08/98	1998	93	636	669	6.10	10/13/98	2.48	290	MESS
11	E5013	9	AN	7001	2	03/06/99	1999	91	578	574	4.90	10/20/99	2.14	254	T41
12	E5013	9	AN	KM11	0	01/01/00	2000	n/a	n/a	n/a	n/a	n/a	n/a	n/a	UNKN
13	E5013	9	AN	n/a	n/a	02/07/00	2000	2.07	238	211	6.15	10/01/00	2.07	238	T11
14	E5013	9	AN	n/a	n/a	02/07/00	2000	2.18	268	UNKN	6.14	10/01/00	2.18	268	UNKN
15	E5013	9	AN	n/a	n/a	02/07/00	2000	2.46	294	UNKN	6.13	10/01/00	2.46	294	UNKN
16	E5013	9	AN	n/a	n/a	02/07/00	2000	2.95	n/a	n/a	n/a	n/a	n/a	n/a	HP95
17	E5025	9	AN	7021	1	11/09/96	1996	94	426	391	1.30	08/23/97	1.30	148	3F5M
18	E5025	9	AN	7145	2	03/15/98	1998	68	538	586	4.90	10/13/98	2.22	254	MESS
19	E5025	9	AN	7175	2	03/26/99	1999	96	574	619	5.50	10/20/99	2.32	279	S032
20	E5025	9	AN	7060	2	02/24/00	2000	89	605	526	4.80	11/07/00	2.01	236	HH55
21	E5025	9	AN	7133	2	02/25/01	2001	89	786	680	5.70	11/08/01	2.72	307	796
22	E5025	9	AN	7256	3	03/20/02	2002	102	708	637	6.11	11/07/02	2.61	305	UNKN
23	E5025	9	AN	7153	2	03/14/03	2003	90	682	617	6.11	11/13/03	2.43	280	TAN212
24	E5025	9	AN	P4230	3	04/19/04	2004	102	n/a	n/a	n/a	n/a	n/a	n/a	UNKN
25	E5036	9	AN	7266	3	04/07/07	2007	70	248	394	2.60	08/23/97	1.29	180	WHT
26	E5036	9	AN	7141	2	03/13/98	1998	78	530	574	5.40	10/13/98	2.11	248	MESS
27	E5036	9	AN	7152	2	03/20/99	1999	89	564	592	4.60	10/19/99	2.23	265	MESS
28	E5036	9	AN	7118	3	03/01/00	2000	102	640	541	4.80	11/07/00	2.14	255	HP96
29	E5036	9	AN	7261	3	03/20/01	2001	106	758	680	5.60	11/08/01	2.80	325	L26
30	E5036	9	AN	7140	2	03/03/02	2002	84	622	563	6.11	11/07/02	2.16	250	UNKN

Birth weight of 5 lbs?

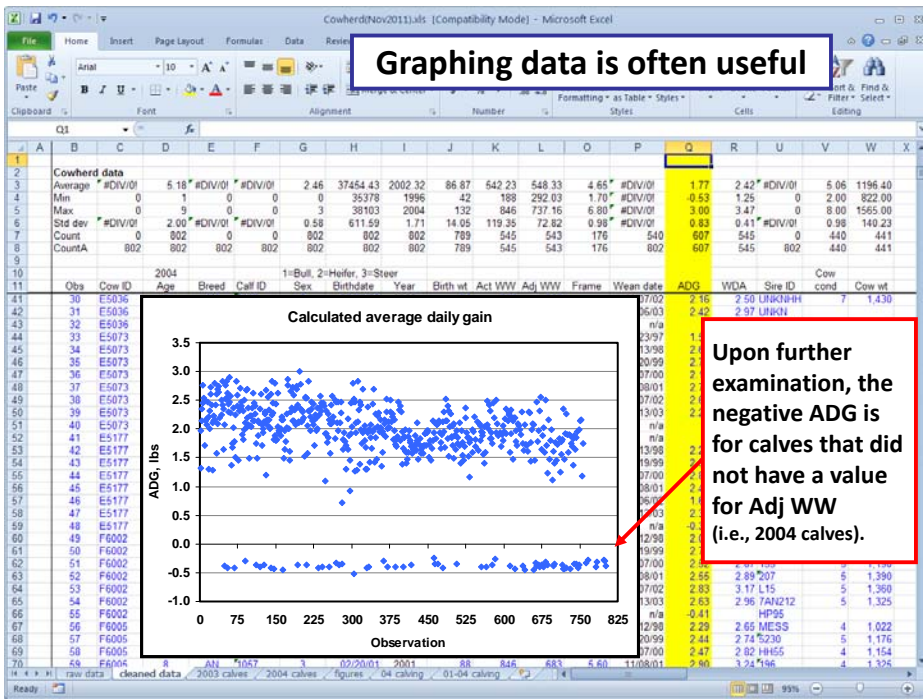
Do you notice any outliers?

"Cleaned up" data

Obs	Cow ID	2004	Age	Breed	Call ID	Sex	1=Bull, 2=Heifer, 3=Steer	Year	Birth wt	Act WW	ADG	WDA	Site ID	Cow cond	Cow wt
1	E5010	9	AN	7051	2	02/21/97	1997	72	500	1.32	172	132	1,172		
2	E5010	9	AN	7148	2	03/15/98	1998	82	500	1.22	158	132	1,172		
3	E5010	9	AN	9028	3	02/27/99	1999	92	642	594	5.50	10/19/99	2.35	274	144
4	E5010	9	AN	7014	2	02/18/00	2000	86	646	550	5.70	11/06/00	2.14	247	SKOG
5	E5010	9	AN	7240	3	03/18/01	2001	112	760	677	5.50	11/08/01	2.76	323	SR110
6	E5010	9	AN	7044	2	02/22/02	2002	102	734	634	6.00	11/07/02	2.45	284	SR34
7	E5010	9	AN	103178	3	03/19/03	2003	106	714	628	6.11	11/13/03	2.54	299	TAN221
8	E5010	9	AN	P4160	3	03/25/04	2004	85	n/a	n/a	n/a	n/a	n/a	n/a	HP95
9	E5013	9	AN	7330	1	11/30/96	1996	58	512	445	0.83	08/23/97	1.71	192	3F5M
10	E5013	9	AN	7129	2	03/08/98	1998	93	636	669	6.10	10/13/98	2.48	290	MESS
11	E5013	9	AN	7001	2	03/06/99	1999	91	578	574	4.90	10/20/99	2.14	254	T41
12	E5013	9	AN	KM11	0	01/01/00	2000	n/a	n/a	n/a	n/a	n/a	n/a	n/a	UNKN
13	E5013	9	AN	n/a	n/a	02/07/00	2000	2.07	238	211	6.15	10/01/00	2.07	238	T11
14	E5013	9	AN	n/a	n/a	02/07/00	2000	2.18	268	UNKN	6.14	10/01/00	2.18	268	UNKN
15	E5013	9	AN	n/a	n/a	02/07/00	2000	2.46	294	UNKN	6.13	10/01/00	2.46	294	UNKN
16	E5013	9	AN	n/a	n/a	02/07/00	2000	2.95	n/a	n/a	n/a	n/a	n/a	n/a	HP95
17	E5025	9	AN	7021	1	11/09/96	1								



Graphing data is often useful



Focusing on 2004 birth weight ...

- What is the average, how variable is it, and what kind of distribution does it follow?
- How do bulls/steers and heifers compare?
- Is birth weight related to cow age?
- Is birth weight related to calving date?

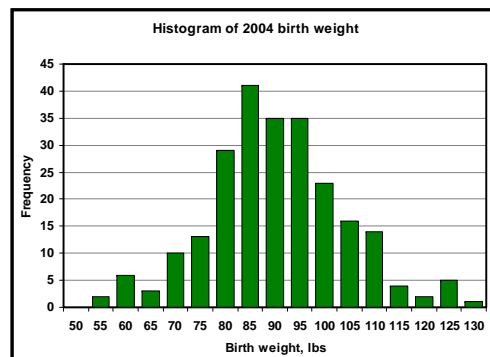


Focusing on birth weight ...

- What is the average, how variable is it, and what kind of distribution does it follow?

2004 Birth wt	
Mean	88.95
Standard Error	0.87
Median	89
Mode	80
Standard Deviation	13.45
Sample Variance	180.89
Kurtosis	0.36
Skewness	0.16
Range	74
Minimum	54
Maximum	128
Sum	21260
Count	239

Descriptive statistics



Histogram

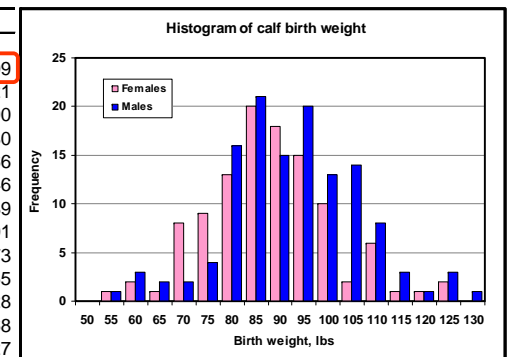


Focusing on birth weight ...

- How do steers and heifers compare?

2004 Birth wt	Females	Males
Mean	86.75	91.09
Standard Error	1.22	1.21
Median	86	90
Mode	82	80
Standard Deviation	12.73	13.66
Sample Variance	161.98	186.46
Kurtosis	0.63	0.39
Skewness	0.37	0.01
Range	68	73
Minimum	54	55
Maximum	122	128
Sum	9456	11568
Count	109	127

Descriptive statistics



Histogram

Focusing on birth weight ...

- How do steers and heifers compare?

t-Test: Two-Sample Assuming Unequal Variances

	Females	Males
Mean	86.75	91.09
Variance	161.98	186.46
Observations	109	127
Hypothesized Mean Difference	0 (actual difference = 4.34)	
df	232	
t Stat	-2.5217	
P(T<=t) one-tail	0.0062	
t Critical one-tail	1.6514	
P(T<=t) two-tail	0.0123	
t Critical two-tail	1.9702	

Focusing on birth weight ...

- How do steers and heifers compare?

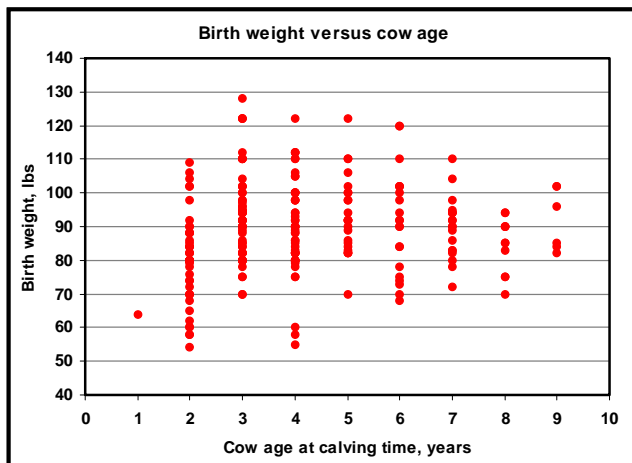
F-Test Two-Sample for Variances

	Females	Males
Mean	86.75	91.09
Variance	161.98	186.46
Observations	109	127
df	108	126
F	0.8687	
P(F<=f) one-tail	0.2264	
F Critical one-tail	0.7346	

Note: p-value of one-tailed t-Test assuming equal variances = 0.0064

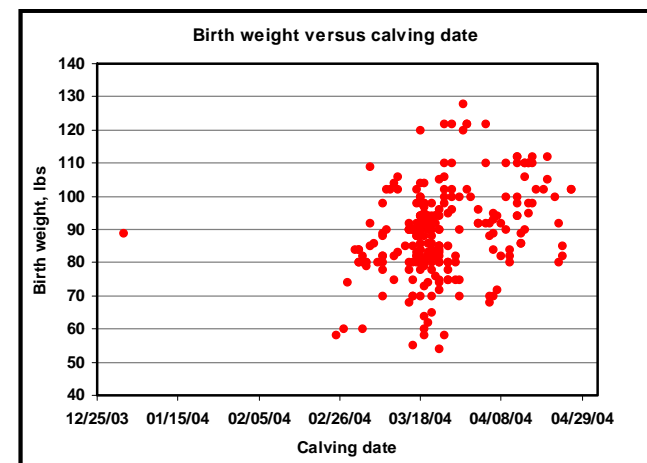
Focusing on birth weight ...

- Is birth weight related to cow age?



Focusing on birth weight ...

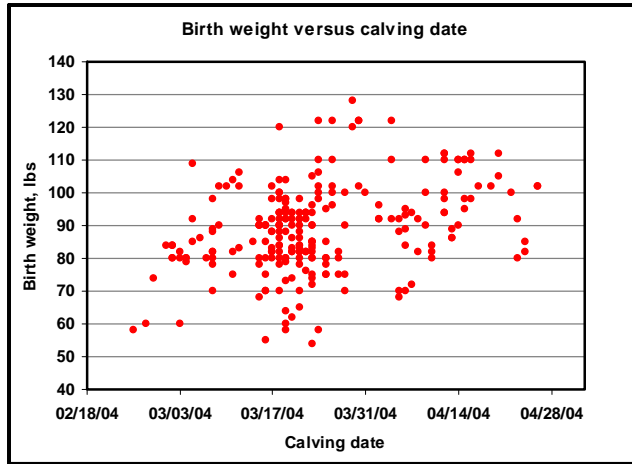
- Is birth weight related to calving date?





Focusing on birth weight ...

- Is birth weight related to calving date?



Regression analysis

$$BW = b_0 + b_1(S) + b_2(A) + b_3(A)^2 + b_4(BD) + e$$

where, $b_0 - b_4$ are coefficients we want to estimate and e depicts an estimation error.

- S = binary variable (1 if heifer, else 0)
- A = age of cow at calving (years)
- A^2 = age of cow squared
- BD = birth date of calf

b 's are "picked" to minimize sum of squared errors, where error is the difference between predicted and actual BW.



Regression analysis -- birth weight

SUMMARY OUTPUT						
<i>Regression Statistics</i>						
R Square	0.1592					
Standard Error	12.4373					
Observations	239					
<i>ANOVA</i>						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	
Regression	4	6,856	1713.95	11.08016	0.0000	
Residual	234	36,197	154.69			
Total	238	43,052				
	<i>Coef</i>	<i>Std err</i>	<i>t Stat</i>	<i>P-value</i>	<i>Low 95%</i>	<i>Up 95%</i>
Intercept	54.5663	6.0633	8.9994	0.0000	42.6206	66.5119
Cow age	6.1284	2.2219	2.7582	0.0063	1.7510	10.5058
Cow age sq	-0.5732	0.2194	-2.6125	0.0096	-1.0054	-0.1409
Sex (H)	-3.6218	1.6245	-2.2295	0.0267	-6.8223	-0.4213
Birthdate	0.2692	0.0615	4.3778	0.0000	0.1480	0.3903

1 minus *P-value* reflects confidence level of value being statistically different from zero.



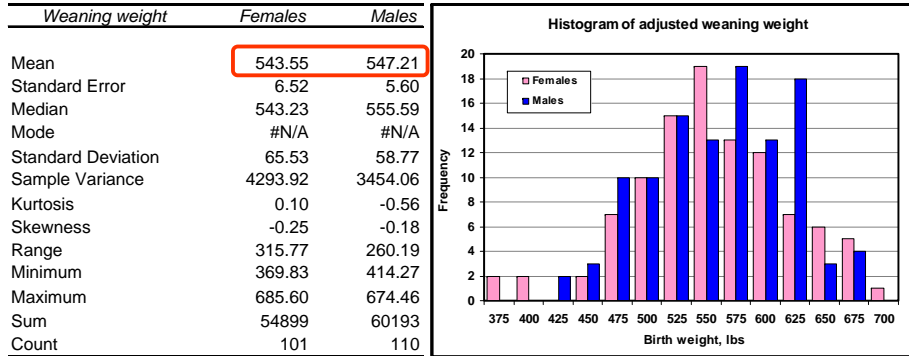
Focusing on adj weaning weight ...

- What is the average, how variable is it, and what kind of distribution does it follow?
- How do steers and heifers compare?
- What factors determine weaning weight?



Focusing on adj weaning weight ...

- What is average, variability, distribution, and how do steers and heifers compare?



Descriptive statistics

Histogram



Focusing on adj weaning weight ...

- How do steers and heifers compare?

t-Test: Two-Sample Assuming Unequal Variances

	Females	Males
Mean	543.55	547.21
Variance	4293.92	3454.06
Observations	101	110
Hypothesized Mean Difference	0	
df	201	
t Stat	-0.4256	
P(T<=t) one-tail	0.3354	
t Critical one-tail	1.6525	
P(T<=t) two-tail	0.6709	
t Critical two-tail	1.9718	



Actual weaning weight ...

Actual WW = f (BW, cow age, sex, birth date)

Conceptual model – actual weaning weight is a function of birthweight, cow age, sex of calf, and birth date.

Correlation

	Act WW	BW	AGE	Steer	Birthdate	AGExBD
Act WW	1.0000					
BW	0.1504	1.0000				
Cow age	0.2799	0.4757	1.0000			
Steer	0.0663	0.0784	-0.0132	1.0000		
Birthdate	-0.4241	0.4421	0.3351	-0.1038	1.0000	
AGExBD	0.0228	0.5628	0.9095	-0.0639	0.6692	1.0000

What is interpretation of correlation between Steer (S=1, H=0) and Birthdate?



Regression analysis

$$\text{Actual WW} = b_0 + b_1(\text{BW}) + b_2(\text{BW})^2 + b_3(\text{A}) + b_4(\text{S}) + b_5(\text{BD}) + b_6(\text{AxBD}) + e$$

where,

- BW = birth weight (pounds)
- A = age of cow at calving (years)
- S = sex of calf (steer=1, heifer=0)
- BD = birth date of calf
- $b_0 - b_6$ are coefficients to estimate and e depicts an estimation error (b's are "picked" to minimize sum of squared errors)

Regression analysis – actual WW

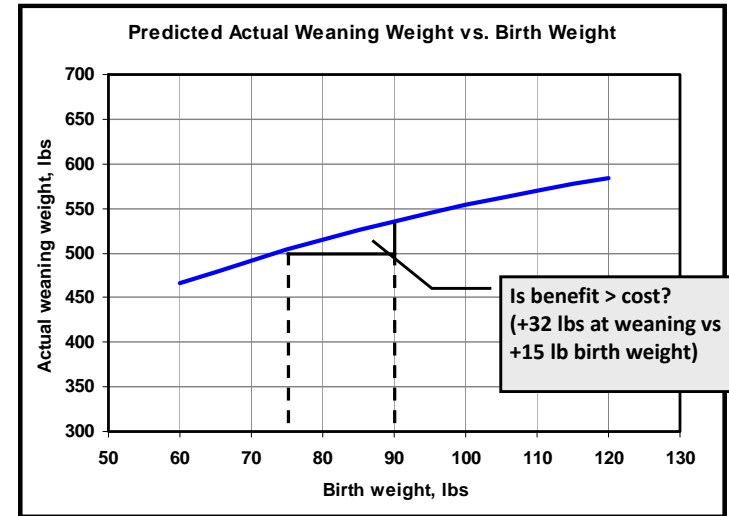
SUMMARY OUTPUT

Regression Statistics	
R Square	0.4544
Standard Error	75.672624
Observations	213

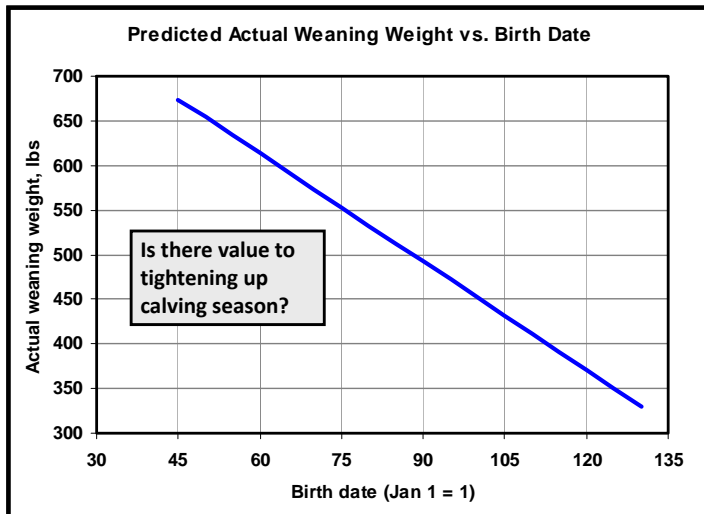
ANOVA					
	df	SS	MS	F	P-value
Regression	6	982514	163752	28.60	0.0000
Residual	206	1179627	5726		
Total	212	2162141			

	Coef	Std Err	t Stat	P-value	Low 95%	Up 95%
Intercept	296.943	132.074	2.2483	0.0256	36.553	557.333
BW	4.083	2.974	1.3731	0.1712	-1.780	9.946
BW sq	-0.0118	0.0165	-0.7151	0.4754	-0.0444	0.0208
Cow age	64.280	15.681	4.0992	0.0001	33.364	95.197
Steer	-6.723	10.586	-0.6351	0.5261	-27.594	14.147
Birthdate	-1.5532	0.8309	-1.8692	0.0630	-3.1913	0.0850
AGExBD	-0.5459	0.1962	-2.7828	0.0059	-0.9327	-0.1592

Relationship between BW & Act WW ...



Relationship between birth date & Act WW ...



Backgrounding trial data ...

- Calf ID
- Producer (two different operations)
- Treatment (product 1 vs 2)
- Days treated, mortality
- Initial and revaccination weight
- Days on feed
- Ending weight
- Castrate and dehorn (Y/N)
- Load



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Formula bar: =STDEV(C14:C5000)

Data as I received it

0 = not dead starting wt. association 1 = ending wt. scoring temp. 0 = no 0 = no
1 = dead 1 = yes 1 = yes

Animal ID	Owner	Load	Trt	R1	R1Days	R2	R2Days	R3	R3Days	Mortality	StWt	ReVacWt	EndWt	Temp	Castrate	Dehom	DOF	
4	5000	M	1	2	1	4	0	0	0	0	540	534	740	1	0	94		
5	5001	M	1	2	0	0	0	0	0	0	600	562	652	1	0	94		
6	5002	M	1	2	0	0	0	0	0	0	578	554	840	1	0	94		
7	5003	M	1	1	1	4	1	4	1	3	1	504	482	1	1			
8	5004	M	1	2	0	0	0	0	0	0	514	520	828	0	0	94		
9	5005	M	1	1	1	8	1	2	1	1	0	546	494	654	1	0	109	
10	5006	M	1	2	1	7	1	4	0	0	0	576	590	654	1	0	94	
11	5007	M	1	1	0	0	0	0	0	0	508	538	826	0	0	94		
12	5008	M	1	1	1	4	0	0	0	0	566	524	722	1	0	94		
13	5009	M	1	1	0	0	0	0	0	0	528	508	720	0	0	94		
14	5010	M	1	2	1	12	1	6	0	1	544	504	780	1	0	94		
15	5011	M	1	2	0	0	0	0	0	0	516	534	780	1	0	94		
16	5012	M	1	2	0	0	0	0	0	0	542	560	844	1	0	94		
17	5013	M	1	2	0	0	0	0	0	0	526	532	726	1	0	94		
18	5014	M	1	1	0	0	0	0	0	0	526	512	760	1	0	94		
19	5015	M	1	1	0	0	0	0	0	0	518	566	774	1	0	94		
20	5016	M	1	2	1	4	1	4	0	0	554	508	662	1	0	94		
21	5017	M	1	1	0	0	0	0	0	0	536	538	766	0	0	94		
22	5018	M	1	2	1	4	0	0	0	0	530	476	712	1	1	94		
23	5019	M	1	2	1	4	1	4	1	4	0	490	500	684	0	0	109	
24	5020	M	1	1	0	0	0	0	0	0	538	538	730	1	0	94		
25	5021	M	1	2	0	0	0	0	0	0	516	518	704	1	0	94		
26	5022	M	1	1	1	4	0	0	0	0	540	540	746	0	0	94		
27	5023	M	1	1	0	0	0	0	0	0	536	572	788	0	0	94		
28	5024	M	1	1	0	0	0	0	0	0	530	550	794	0	0	94		
29	5025	M	1	1	0	0	0	0	0	0	534	536	740	1	0	94		
30	5026	M	1	2	0	0	0	0	0	0	516	490	710	1	0	94		
31	5027	M	1	1	0	0	0	0	0	0	526	554	800	1	0	94		
32	5028	M	1	1	0	0	0	0	0	0	522	520	736	1	0	94		
33	5029	M	1	2	1	15	1	6	0	1	556	520	1	1	1			
34	5030	M	1	1	0	0	0	0	0	0	574	564	875	1	0	94		
35	5031	M	1	1	0	0	0	0	0	0	480	478	750	0	0	94		
36	5032	M	1	1	0	0	0	0	0	0	510	496	698	1	0	94		
37	5033	M	1	1	1	4	1	6	0	1	534	496	1	0				
38	5034	M	1	2	1	7	0	0	0	0	574	562	752	1	0	94		
39	5035	M	1	1	0	0	0	0	0	0	518	534	776	0	0	94		
40	5036	M	1	1	0	0	0	0	0	0	544	544	800	1	0	94		
41	5037	M	1	2	0	0	0	0	0	0	534	542	776	0	0	94		
42	5038	M	1	2	0	0	0	0	0	0	564	570	810	1	0	94		
43	5039	M	1	2	1	4	1	9	0	0	630	612	684	1	0	109		
44	5040	M	1	2	1	6	0	0	0	1	526	502	1	0				
7361	5041	M	1	2	0	0	0	0	0	0	520	426	734	0	0	94		

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Formula bar: =STDEV(C14:C5000)

"Cleaned up" data

Vaccine background trial conducted in fall of 2003

Animal ID	Owner	Load	Trt	R1	R1Days	R2	R2Days	R3	R3Days	Mortality	StWt	ReVacWt	EndWt	Temp	Castrate	Dehom	DOF	
4	5000	M	1	2	1	4	0	0	0	0	540	534	740	1	0	94	2.1	
5	5001	M	1	2	0	0	0	0	0	0	600	562	652	1	0	94	2.6	
6	5002	M	1	2	0	0	0	0	0	0	578	554	840	1	0	94	2.7	
7	5003	M	1	1	1	4	1	4	1	3	1	504	482	1	1		n/a	
8	5004	M	1	2	0	0	0	0	0	0	514	520	828	0	0	94	3.3	
9	5005	M	1	1	1	8	1	2	1	1	0	546	494	654	1	0	109	0.9
10	5006	M	1	2	1	7	1	4	0	0	0	576	590	654	1	0	94	4.0
11	5007	M	1	1	0	0	0	0	0	0	508	538	826	0	0	94	3.3	
12	5008	M	1	1	1	4	0	0	0	0	566	524	722	1	0	94	1.6	
13	5009	M	1	1	0	0	0	0	0	0	528	508	720	0	0	94	2.0	
14	5010	M	1	2	1	12	1	6	0	1	544	504	780	1	0	94	n/a	
15	5011	M	1	2	0	0	0	0	0	0	516	534	780	1	0	94	2.8	
16	5012	M	1	2	0	0	0	0	0	0	542	560	844	1	0	94	2.7	
17	5013	M	1	2	0	0	0	0	0	0	526	532	726	1	0	94	2.1	
18	5014	M	1	1	0	0	0	0	0	0	526	512	760	1	0	94	2.4	
19	5015	M	1	1	0	0	0	0	0	0	518	566	774	1	0	94	2.7	
20	5016	M	1	2	1	4	1	4	0	0	554	508	662	1	0	94	1.1	
21	5017	M	1	1	0	0	0	0	0	0	536	538	766	0	0	94	2.4	
22	5018	M	1	2	1	4	0	0	0	0	530	476	712	1	1	94	1.9	
23	5019	M	1	2	1	4	1	4	1	4	0	490	500	684	0	0	109	0.8
24	5020	M	1	1	0	0	0	0	0	0	538	538	730	1	0	94	2.0	
25	5021	M	1	2	0	0	0	0	0	0	516	518	704	1	0	94	2.0	
26	5022	M	1	1	1	4	0	0	0	0	540	540	746	0	0	94	2.1	
27	5023	M	1	1	0	0	0	0	0	0	536	572	788	0	0	94	2.6	
28	5024	M	1	1	0	0	0	0	0	0	530	550	794	0	0	94	2.8	
29	5025	M	1	1	0	0	0	0	0	0	534	536	740	1	0	94	2.1	
30	5026	M	1	2	0	0	0	0	0	0	516	490	710	1	0	94	2.0	
31	5027	M	1	1	0	0	0	0	0	0	526	554	800	1	0	94	2.8	
32	5028	M	1	1	0	0	0	0	0	0	522	520	736	1	0	94	2.2	
33	5029	M	1	2	1	15	1	6	0	1	556	520	1	1	1		n/a	
34	5030	M	1	1	0	0	0	0	0	0	574	564	875	1	0	94	3.2	
35	5031	M	1	1	0	0	0	0	0	0	480	478	750	0	0	94	2.8	
36	5032	M	1	1	0	0	0	0	0	0	510	496	698	1	0	94	2.8	
37	5033	M	1	1	1	4	1	6	0	1	534	496	1	0				
38	5034	M	1	2	1	7	0	0	0	0	574	562	752	1	0	94	2.8	
39	5035	M	1	1	0	0	0	0	0	0	518	534	776	0	0	94	2.1	
40	5036	M	1	1	0	0	0	0	0	0	544	544	800	1	0	94	2.0	
41	5037	M	1	2	0	0	0	0	0	0	534	542	776	0	0	94	2.8	
42	5038	M	1	2	0	0	0	0	0	0	564	570	810	1	0	94	2.2	
43	5039	M	1	2	1	4	1	9	0	0	630	612	684	1	0	109	n/a	
44	5040	M	1	2	1	6	0	0	0	1	526	502	1	0				
7361	5041	M	1	2	0	0	0	0	0	0	520	426	734	0	0	94	3.2	

Summary statistics
(Notice the power of 1's and 0's)



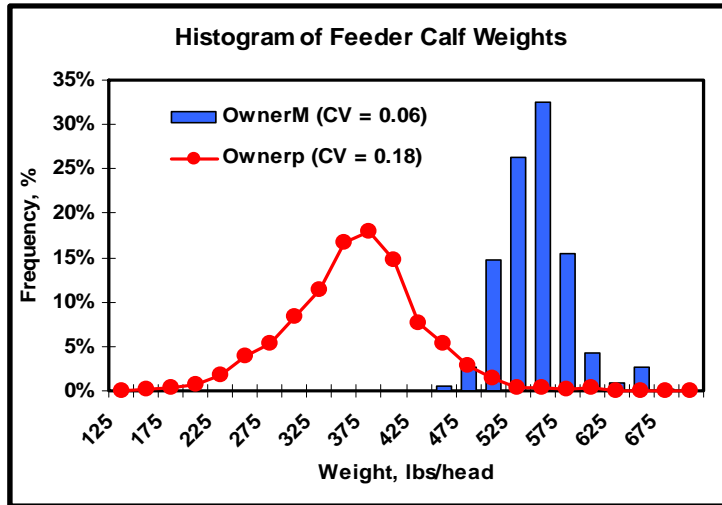
Questions to answer ...

- Starting weight
 - What is the average?
 - Does it vary between cattle owners?
 - How variable is it?
 - What kind of distribution does it follow?
 - Is it similar for both vaccination treatments?

Starting weight – descriptive statistics

Start weight	All	OwnerM	OwnerP
Mean	421.14	530.95	349.84
Standard Error	3.17	1.66	2.52
Median	404	530	354
Mode	518	518	372
Standard Deviation	103.93	34.12	64.33
Sample Variance	10801.12	1164.08	4138.01
Kurtosis	-1.05	1.55	0.74
Skewness	-0.06	0.78	0.03
Range	532	228	460
Minimum	136	440	136
Maximum	668	668	596
Sum	451459	224060	227399
Count	1072	422	650

Starting weight – descriptive statistics



Starting weight – descriptive statistics

Owner	Data	Trt		
		1	2	Total
M	Average of StWt	528.9	533.1	530.9
	Min of StWt	440	446	440
	Max of StWt	668	642	668
	StdDev of StWt	33.7	34.5	34.1
	Count of StWt	214	208	422
P	Average of StWt	353.1	346.6	349.8
	Min of StWt	176	136	136
	Max of StWt	578	596	596
	StdDev of StWt	62.7	65.8	64.3
	Count of StWt	327	323	650
Total Average of StWt		422.6	419.6	421.1
Total Min of StWt		176	136	136
Total Max of StWt		668	642	668
Total StdDev of StWt		101.1	106.8	103.9
Total Count of StWt		541	531	1072

Excel pivot table

Starting weight – t-test of means ...

- How do different treatments compare?

OwnerM			OwnerP		
t-Test: Two-Sample Assuming Equal Variances			t-Test: Two-Sample Assuming Equal Variances		
	Variable 1	Variable 2	Variable 1	Variable 2	
Mean	528.8504673	533.1057692	353.0764526	346.5727554	
Variance	1137.695845	1187.621609	3935.745671	4334.295156	
Observations	214	208	327	323	
Pooled Variance	1162.302114		4133.790322		
Hypothesized Mean Dif	0		0		
df	420		648		
t Stat	-1.281897192		1.289450126		
P(T<=t) one-tail	0.100292939		0.098850847		
t Critical one-tail	1.648489714		1.647208509		
P(T<=t) two-tail	0.200585877		0.197701695		
t Critical two-tail	1.965628207		1.963631589		

Questions to answer ...

- Average daily gain
 - What is the average?
 - Does it vary between cattle owners?
 - How variable is it?
 - What kind of distribution does it follow?
 - Is it similar for both vaccination treatments?
 - Do other variables impact it?

ADG – descriptive statistics

Owner	Data	Trt		
		1	2	Total
M	Average of ADG	2.39	2.34	2.37
	Min of ADG	-0.11	0.02	-0.11
	Max of ADG	3.83	4.03	4.03
	StdDev of ADG	0.66	0.72	0.69
	Count of ADG	201	199	400
P	Average of ADG	1.78	1.91	1.84
	Min of ADG	-0.68	-0.64	-0.68
	Max of ADG	3.45	3.74	3.74
	StdDev of ADG	0.79	0.73	0.76
	Count of ADG	279	276	555
Total Average of ADG		2.04	2.09	2.06
Total Min of ADG		-0.68	-0.64	-0.68
Total Max of ADG		3.83	4.03	4.03
Total StdDev of ADG		0.80	0.76	0.78
Total Count of ADG		480	475	955

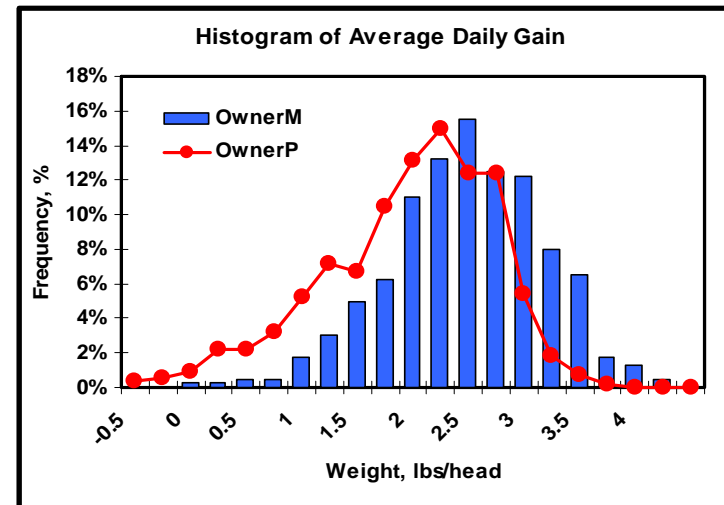
Difference
(Trt 1 - 2)
+0.05

-0.13

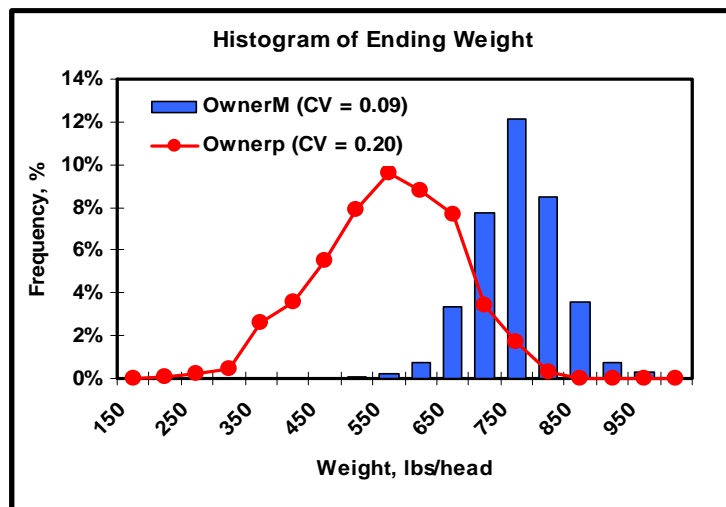
-0.05

Excel pivot table

ADG – descriptive statistics



Ending weight – descriptive statistics



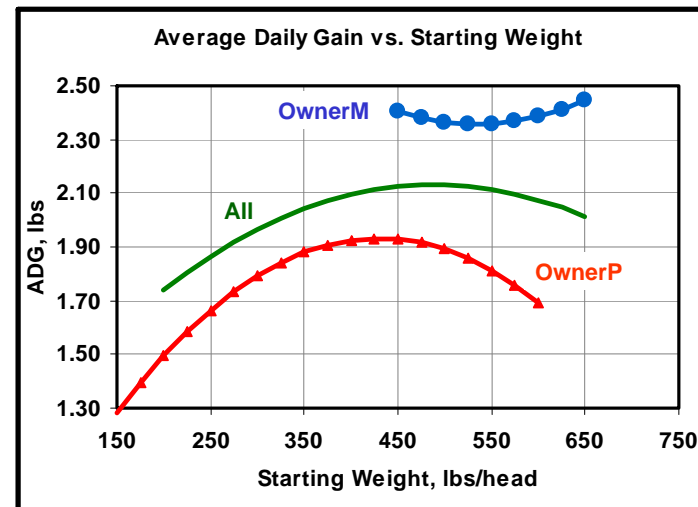
ADG -- Regression analysis

OwnerM						
SUMMARY OUTPUT						
Regression Statistics						
R Square	0.3924					
Standard Error	0.5442					
Observations	399					
ANOVA						
	df	SS	MS	F	P-value	
Regression	6	74.9715798	12.4952633	42.1852133	1.2022E-39	
Residual	392	116.110429	0.29620007			
Total	398	191.082009				
	Coef	Std err	t Stat	P-value	Low 95%	Up 95%
Intercept	4.7717	4.1542	1.1487	0.2514	-3.3955	12.9389
Trt1	-0.0072	0.0550	-0.1315	0.8955	-0.1153	0.1009
StWt	-0.0070	0.0153	-0.4574	0.6476	-0.0370	0.0231
StWt sq	0.0000	0.0000	0.4664	0.6412	0.0000	0.0000
Castrate	-0.3907	0.0635	-6.1493	0.0000	-0.5156	-0.2658
Dehorn	-0.1286	0.0943	-1.3640	0.1734	-0.3140	0.0568
Res days	-0.1042	0.0076	-13.7837	0.0000	-0.1191	-0.0894

ADG -- Regression analysis

OwnerP						
SUMMARY OUTPUT						
Regression Statistics						
R Square	0.2929					
Standard Error	0.6455					
Observations	553					
ANOVA						
	df	SS	MS	F	P-value	
Regression	6	94.2268558	15.704476	37.6868529	2.707E-38	
Residual	546	227.523479	0.41670967			
Total	552	321.750335				
	Coef	Std err	t Stat	P-value	Low 95%	Up 95%
Intercept	0.8772	0.5109	1.7169	0.0866	-0.1264	1.8809
Trt1	-0.1558	0.0551	-2.8274	0.0049	-0.2640	-0.0476
StWt	0.0072	0.0028	2.5207	0.0120	0.0016	0.0127
StWt sq	0.0000	0.0000	-2.0909	0.0370	0.0000	0.0000
Castrate	-0.2196	0.0654	-3.3588	0.0008	-0.3480	-0.0912
Dehorn	0.3267	0.1237	2.6408	0.0085	0.0837	0.5697
Res days	-0.0862	0.0067	-12.8239	0.0000	-0.0994	-0.0730

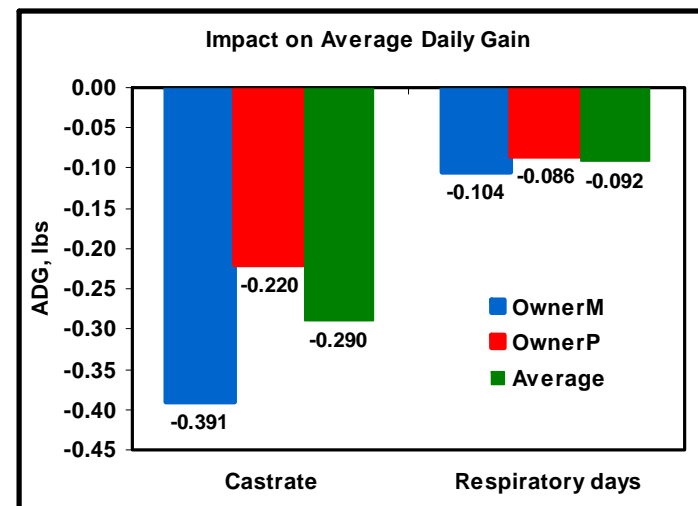
Relationship between starting weight & ADG



Relationship between health factors & ADG

		Castrate			
Owner	Data	0	1	Total	Difference
M2	Avg of ADG	2.71	2.24	2.37	-0.47
	Min of ADG	-0.11	0.02	-0.11	
	Max of ADG	4.03	3.83	4.03	
	Count of ADG	106	294	400	
P2	Avg of ADG	2.11	1.76	1.84	-0.35
	Min of ADG	0.16	-0.68	-0.68	
	Max of ADG	3.74	3.23	3.74	
	Count of ADG	135	420	555	
Total Avg of ADG		2.37	1.96	2.06	-0.41
Total Min of ADG		-0.11	-0.68	-0.68	
Total Max of ADG		4.03	3.83	4.03	
Total Count of ADG		241	714	955	

Relationship between health factors & ADG



What does this all mean?

- We have now estimated the impact that buying bulls and castrating them and treating for respiratory problems have on ADG (while accounting for other variables)
 - Why do we bother?
 - Does this information have any value?
 - How might we use this information?

Estimated impact on gain associated with health factors...

	OwnerM	OwnerP	Average
Starting weight	531	350	427
Total days on feed	84.1	93.8	89.7
Health factor			
Castrate	-0.391	-0.220	-0.290
Respiratory days	-0.104	-0.086	-0.092
Avg days treated for res	2.4	3.0	2.7
Max days treated for res	17.0	19.0	19.0
ADG impact on total weight gain			
Castrate	-32.9	-20.6	-26.0
Treat for respiratory (avg days)	-20.6	-24.0	-22.3
Treat for respiratory (max days)	-149.1	-153.7	-156.8

What's the economic impact of this "lost" weight?

Excel spreadsheet that can be used to calculate historical value of gain by weight, sex, and time period.

The screenshot shows an Excel spreadsheet with the following data for 'User-specified Value of gain':

	1	2	3	4	5	6
Starting month (Jan=1, Feb=2, etc)	10	10	10	10	5	5
Class (weight/sex) of Cattle - Starting	350 lb str	550 lb str	350 lb str	350 lb str	550 lb str	550 lb str
Ending month (Oct=10, Nov=11, etc)	1	1	1	3	8	10
Class (weight/sex) of Cattle - Ending	550 lb str	750 lb str	550 lb str	650 lb str	750 lb str	850 lb str
Weight gain	200	200	200	300	200	300
Months / Average daily gain (ADG)*	3 / 2.19	3 / 2.19	3 / 2.19	5 / 1.97	3 / 2.19	5 / 1.97

* Months between starting and ending periods and calculated average daily gain (ADG) assuming 30.4 days per month.

Estimated costs associated with health factors

	OwnerM	OwnerP	Average
Starting weight	531	350	427
Total days on feed	84.1	93.8	89.7
Health factor			
Castrate	-0.391	-0.220	-0.290
Respiratory days	-0.104	-0.086	-0.092
Avg days treated for res	2.4	3.0	2.7
Max days treated for res	17.0	19.0	19.0
ADG impact on total weight gain			
Castrate	-32.9	-20.6	-26.0
Treat for respiratory (avg days)	-20.6	-24.0	-22.3
Treat for respiratory (max days)	-149.1	-153.7	-156.8
Purchase price discount, \$/cwt			
Castrate	-\$4.69	-\$4.74	-\$4.76
Treat for respiratory (avg days)	-\$2.95	-\$5.51	-\$4.08
Treat for respiratory (max days)	-\$21.28	-\$35.37	-\$28.72
Value of gain, \$/cwt	\$80.52		(2006-2010 avg for 350 to 550 from Oct-Jan)
Value of gain, \$/cwt	\$75.81		(2006-2010 avg for 550 to 750 from Oct-Jan)
Average	\$78.17		

Using the model results to make economic decisions (an alternative approach to take)

Baseline Assumptions for Analysis

	OwnerM	OwnerP	Average
Beginning date	10/15/11	10/15/11	10/15/11
Starting weight	531	350	427
Initial value, \$/cwt	\$147.88	\$174.44	\$163.53
Days on feed	84.1	93.8	89.7
Total cost of gain, \$/cwt (baseline animal)	\$85.00	\$90.00	\$87.50
Ending date	01/07/12	01/16/12	01/12/12

Using the model results to make economic decisions

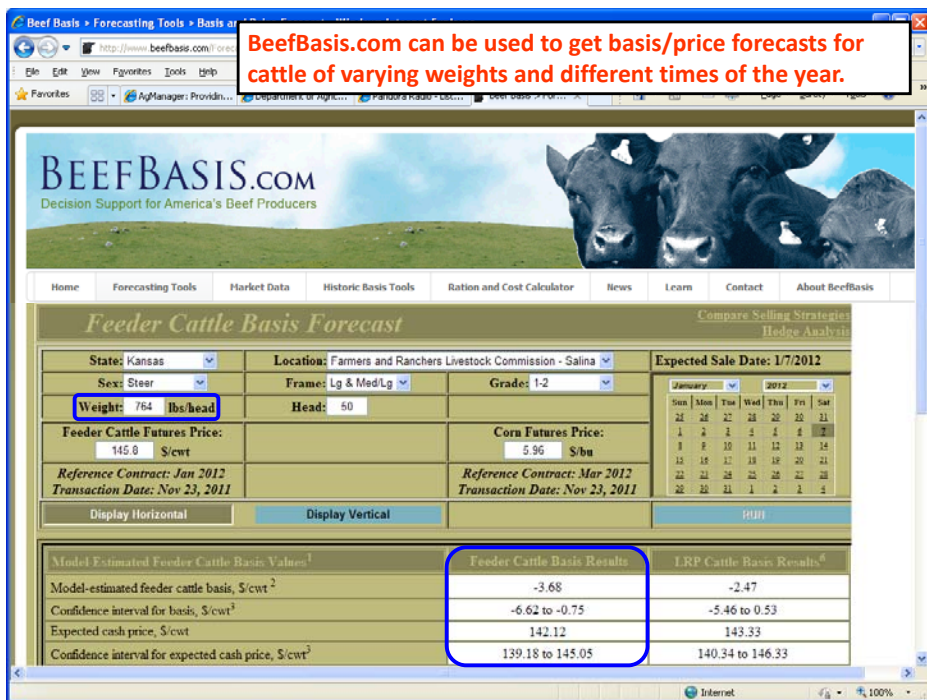
Model Estimated Average Daily Gain versus Health Factors, lbs/day

	Castrate	Res days	OwnerM	OwnerP	Average
Base	0	0	2.77	2.53	2.45
Scenario 1	0	2.7	2.49	2.30	2.20
Scenario 2	0	19	0.79	0.89	0.70
Scenario 3	1	0	2.38	2.31	2.16
Scenario 4	1	2.7	2.10	2.08	1.91
Scenario 5	1	19	0.40	0.68	0.41

Estimated Ending Weight versus Health Factors, lbs/head

	Castrate	Res days	OwnerM	OwnerP	Average
Base	0	0	764	587	647
Scenario 1	0	2.7	740	566	624
Scenario 2	0	19	597	434	490
Scenario 3	1	0	731	567	621
Scenario 4	1	2.7	707	545	598
Scenario 5	1	19	564	413	464

BeefBasis.com can be used to get basis/price forecasts for cattle of varying weights and different times of the year.



Using the model results to make economic decisions

Selling Price (estimated using BeefBasis.com), \$/cwt

	Castrate	Res days	OwnerM	OwnerP	Average
Base	0	0	\$142.12	\$153.98	\$148.58
Scenario 1	0	2.7	\$143.03	\$156.08	\$150.40
Scenario 2	0	19	\$152.44	\$172.53	\$164.43
Scenario 3	1	0	\$143.43	\$155.98	\$150.65
Scenario 4	1	2.7	\$144.60	\$158.32	\$152.66
Scenario 5	1	19	\$155.57	\$175.66	\$167.83

Discount on Purchase Price Relative to Base, \$/cwt

	Castrate	Res days	OwnerM	OwnerP	Average
Base	0	0	\$167.18	\$197.42	\$180.06
Scenario 1	0	2.7	-\$4.12	-\$4.81	-\$3.95
Scenario 2	0	19	-\$28.99	-\$38.70	-\$31.58
Scenario 3	1	0	-\$5.68	-\$4.50	-\$4.71
Scenario 4	1	2.7	-\$10.02	-\$9.73	-\$9.11
Scenario 5	1	19	-\$35.90	-\$46.61	-\$38.98



Analyzing your data ...

- Many ways of analyzing data
 - Visual (e.g., charts)
 - Numerical (e.g., summary statistics, regression)
- No one method is correct or “best” in every situation.
- The key to analyzing data (regardless of the method used) is to generate knowledge and information to improve the decisions made by the manager.



Kevin C. Dhuyvetter
785-532-3527
kcd@ksu.edu

