Inside FERC Basis and Regression Analysis Service

What is Hedging Effectiveness?

A major issue facing hedgers today is how to meet the requirements of the Financial Accounting Standards Board Statement Number 133 (FAS 133) - Accounting for Derivative Instruments and Hedging Activities.

With new hedge accounting rules in effect it is even more important than ever to understand the risks associated with hedging exposures on a given pipeline with NYMEX based hedge instruments.

Kase provides information that should serve to satisfy hedge effectiveness requirements relative to longer-term hedges based on Inside FERC pipelines.

One requirement for derivatives is that they must form "effective" hedges. The non-effective portion of the hedge must be marked to market. FAS 133 says that "Both at the inception of the hedge and on an ongoing basis, the hedging relationship is expected to be highly effective."

FAS 133 does not dictate the method of measuring effectiveness. One commonly accepted method is to use R^2, the parameter that describes goodness of fit. A slope and F-statistic are also provided for good measure.

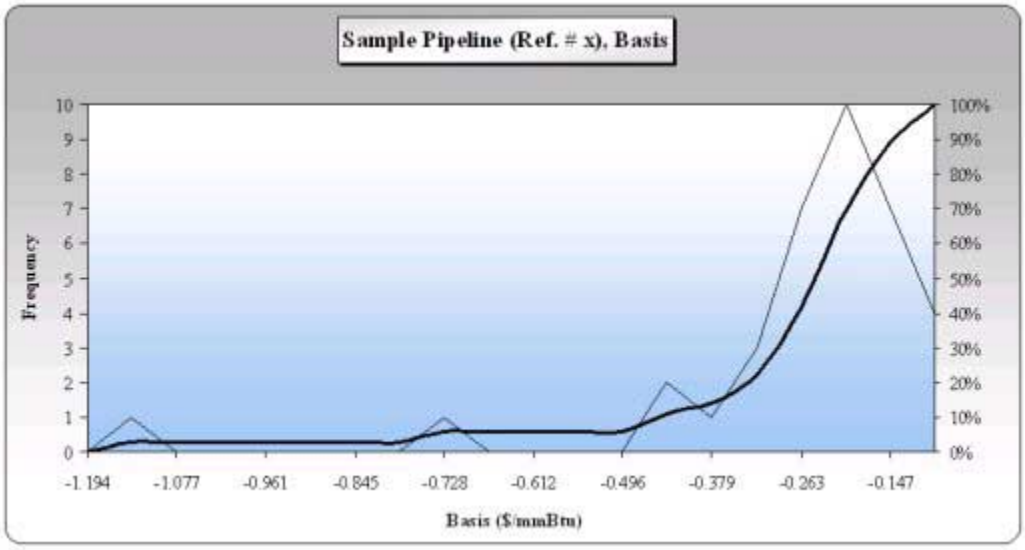
This study will provide the risk manager with information essential to making the decision as to whether to hedge in the underlying (the pipeline index itself) or NYMEX, and if the latter decision is made to asses the risk associated with the decision.

What is in Our Basis Analysis?

Basis Distribution Histogram
The information provides data on what the basis has been for a particular pipeline over the past three years. The data is given in histogram format (distribution of basis versus frequency of occurrence) as well as in tabular form by date (month versus basis), including:

Distribution Histogram Graph of Basis versus NYMEX Last Three day average for the last 36 months.

The sample histogram graph below shows the basis for a given pipeline both as a distribution histogram and cumulatively. The histogram represents the frequency distribution of the basis data where each increment on the x-axis represents a range of basis, where the area under the curve in that interval is proportional to the corresponding frequency.



Basis Descriptive Statistics

Standard statistical measures are given, as defined below the table. Included are the summer (April through October) and winter (November through March) averages. Thus, the subscriber can easily see if there is a large seasonal difference in the basis. In the sample, below, for example, the negative summer basis is almost twice the winter.

Descriptive Stats Basis	
Average	-0.328
Summer Average	-0.124
Winter Average	-0.614
Median	-0.335
Minimum	-2.306
Maximum	0.937
StdDev	0.684
Avg+1 StdDev	0.356
Avg-1 StdDev	-1.012
Slope-12 Point	0.568
Slope-30 Point	0.752
F Stat-12 Point	27.327
F Stat-30 Point	87.330
Most Recent Basis	0.128

Averages

The arithmetical mean of a set of numbers. The quotient obtained by dividing the sum total of a set of figures by the number of figures. The summer and winter averages are seasonal averages.

Median

The value in an ordered set of values below and above which there is an equal number of values or which is the arithmetic mean of the two middle values if there is no one middle number.

Minimum

The smallest, or most negative value assumed by a continuous function defined on a closed interval.

Maximum
The largest, or most positive value assumed by a continuous function defined on a closed interval.

Standard Deviation (StdDev)
A measure of the dispersion of a frequency distribution that is the square root of the arithmetic mean of the squares of the deviation of each of the class frequencies from the arithmetic mean of the distribution

Skew
A degree of asymmetry of a distribution around its mean. A positive skew indicates there is an asymmetrical or "right" tail where more values are skewed to the right. A negative or "left" tail indicates that values are skewed more towards the left or negative values.

Avg+1StdDev, Avg-1StdDev
The value that is one standard deviation above or below the mean. By comparing these values to the percentile ranking, one can get a feel for the difference between a normal bell curve and the actual distribution.

Slope
The Slope is another means of measuring hedge effectiveness. It measures the change in the NYMEX price over the change of the FERC pipeline price. Positive values indicate that both the NYMEX price and pipeline price moved in the same direction. Negative values indicate that the NYMEX pipeline price moved in opposite directions. For example a value of -1.000 would indicate that if the NYMEX price moved up $1.00 then the pipeline price moved down $1.00. Both a 12 and 30-month slope is shown.

F-Statistic
The F-Statistic is another means of measuring hedge effectiveness. It measures whether there is a statistically significant relationship between the NYMEX price and the FERC pipeline price. The significance of of the F-Statistic varies with the number of observations in the regression. Generally one would want to be at or above the 95% confidence level. For a 12-point regression the 95% confidence level is 4.96. For a 30-point regression this would be 4.17. So any value greater than the 95% confidence level is considered to be statistically significant, therefore there is a statistically significant relationship between the NYMEX and pipeline prices.

Most Recent Basis
The most recent basis price based upon the most currently published data.

Basis Percentile Ranking
The basis data is also given in a percentile ranking, on a scale of zero to one hundred that indicates the percent of a distribution that is equal to or below the particular basis value.

Thus in addition to any judgment one may bring to the question, one can ascertain if the current basis is favorable or unfavorable. For example, let's say one is a producer and wishes to sell the basis for the sample pipeline shown below. Let's surmise that the basis quote received is negative $0.45. This basis is between the 5th and 10th percentile, which is a low (adverse) price for the producer. Odds are biased for a move in a favorable direction on the basis. Provided the correlation is acceptably high, it will likely be in the producers best interest to hedge based on NYMEX pricing and look to hedge basis later. The opposite conclusion would hold true for a consumer.

Percentile	Basis
0	-2.306
2.5	-1.367
5	-1.095
10	-0.984
15	-0.924
20	-0.851
25	-0.787
30	-0.678
35	-0.635
40	-0.491
45	-0.377
50	-0.335
55	-0.308
60	-0.217
65	-0.182
70	-0.156
75	-0.075
80	0.128
85	0.411
90	0.725
95	0.906
97.5	0.926
100	0.937

Basis Month-to-Month Change

This table shows the historic month-to-month changes in basis on a scale of zero to one hundred that indicates the percent of a distribution that is equal to or below the particular value in question. In this way one can do a rough estimate of risk in terms of how much fluctuation in the basis may be expected in a given month. For the sample pipeline data below, for example, the 60th percentile change is $0.092. Thus, we can plan on about 60% of the time experiencing an "inefficiency" of $0.092 or less. We can also see that about 20% of the time the basis changed by $0.21 or more.

Month to Month Basis Change	
Percentile	**Change**
0	0.025
5	0.043
10	0.078
20	0.136
30	0.183
40	0.246
50	0.301
60	0.329
70	0.415
80	0.707
90	1.081
95	1.389
100	1.992
Average	0.453

R^2 Descriptive Statistics
Descriptive statistics on R^2, including average, median, standard deviation, and most recent 30 month and 12 month R^2. Standard statistical data is presented for the R^2, as defined below the table. In addition the most R^2 is given for the most recent 30-month period. In that way, the subscriber can compare the effectiveness of a NYMEX hedge on a particular pipeline over a longer, more statistically significant, time frame.

Average
The arithmetical mean of a set of numbers. The quotient obtained by dividing the sum total of a set of figures by the number of figures.

Median
The value in an ordered set of values below and above which there is an equal number of values or which is the arithmetic mean of the two middle values if there is no one middle number.

Minimum
The smallest, or most negative value assumed by a continuous function defined on a closed interval.

Maximum
The largest, or most positive value assumed by a continuous function defined on a closed interval.

Standard Deviation (StdDev)
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Skew
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Avg+1StdDev, Avg-1StdDev
The value that is one standard deviation above or below the mean. By comparing these values to the percentile ranking, one can get a feel for the difference between a normal bell curve and the actual distribution.

Most Recent
The most recent regression based upon the most currently published data.

Descriptive Stats R^2

Average	0.510
Median	0.567
Minimum	0.024
Maximum	0.918
StdDev	0.283
Avg+1StdDev	0.793
Avg-1StdDev	0.227
30 Month R2	0.661
Most Recent	0.690

R^2 Percentile Ranking
Percentile ranking of the R^2, so that one can identify the R^2 associated with a certain percentile, or percent probability, based on historical data The R^2 data is also given in a percentile ranking, on a scale of zero to

one hundred that indicates the percent of a distribution that is equal to or below the particular R^2 value. Thus one can judge what the probabilities may be of the R^2 falling below the critical 0.80 point.

Percentile	R^2
0	0.024
5	0.037
10	0.111
20	0.190
30	0.286
40	0.518
50	0.567
60	0.690
70	0.722
80	0.758
90	0.812
95	0.882
100	0.918

Historical Data

This information is the raw basis data is found by subtracting the last three day NYMEX average settlement price from the underlying published Inside FERC pipeline data. The "month" is the specific NYMEX month, and the month during which the pipeline data is released.

R^2 History is shown by date over the past 36 months, so that non-overlapping periods of R^2 data can be examined. A 12 and 30-point R^2 value is shown.

In addition the table also shows the 12 and 30-point Slope and F Statistic for historical research purposes.

The raw data is available so that the subscriber can perform custom research on the base data. Note that the copyrighted Inside FERC data itself can be obtained from Platt's, at www.platts.com.

Three Year Historical Statistics

Month	Basis	R^2 - 12 point	R^2 - 30 point	Slope - 12 point	Slope - 30 point	F Stat - 12 point	F Stat - 30 point
Sep-01	-0.265	0.708	0.678	1.086	1.035	24.215	58.943
Oct-01	-0.710	0.758	0.680	1.082	1.009	31.269	59.928
Nov-01	-0.552	0.779	0.675	1.105	1.000	34.977	58.074
Dec-01	-0.076	0.815	0.676	1.247	0.997	43.940	58.404
Jan-02	-0.395	0.918	0.676	0.949	0.992	111.266	58.436
Feb-02	-0.306	0.881	0.604	0.969	0.991	74.353	60.716
Mar-02	-0.488	0.883	0.690	1.001	0.988	75.312	62.431
Apr-02	-0.692	0.810	0.690	1.115	0.980	42.702	62.403
May-02	-1.169	0.577	0.687	1.048	0.967	13.613	61.331
Jun-02	-1.080	0.262	0.666	0.655	0.922	5.559	55.025
Jul-02	-1.988	0.131	0.647	0.423	0.878	1.504	51.391
Aug-02	-1.346	0.301	0.650	0.361	0.861	1.121	51.890
Sep-02	-2.138	0.040	0.641	0.208	0.825	0.420	49.905
Oct-02	-2.326	0.024	0.624	-0.135	0.794	0.247	46.469
Nov-02	-1.026	0.025	0.623	0.165	0.791	0.261	46.353
Dec-02	-0.740	0.188	0.623	0.381	0.792	2.314	46.395
Jan-03	-1.588	0.424	0.727	0.613	0.953	7.353	74.642
Feb-03	-2.380	0.518	0.714	0.721	0.960	10.759	69.870
Mar-03	-4.033	0.735	0.702	1.205	1.055	27.791	65.896
Apr-03	-1.836	0.777	0.697	1.256	1.063	34.913	64.533
May-03	-1.175	0.753	0.712	1.145	1.086	30.496	69.157
Jun-03	-1.245	0.733	0.730	1.079	1.367	27.511	78.718
Jul-03	-1.231	0.702	0.700	1.079	1.019	23.575	67.812
Aug-03	-0.653	0.607	0.691	0.995	1.054	15.445	62.960
Sep-03	-0.927	0.533	0.713	1.002	1.110	11.389	69.536
Oct-03	-0.430	0.534	0.699	1.009	1.114	11.472	65.080
Nov-03	-0.459	0.462	0.687	1.390	1.090	0.577	61.370
Dec-03	0.440	0.203	0.644	0.915	0.997	2.543	50.679
Feb-04	-0.645	0.190	0.654	0.847	0.978	2.353	53.009
Mar-04	-0.690	0.262	0.654	1.112	0.964	3.544	52.914
Apr-04	-1.125	0.122	0.655	0.316	0.947	1.392	53.308
May-04	-0.935	0.309	0.641	0.650	0.920	4.474	49.940
Jun-04	-0.960	0.558	0.667	0.885	0.913	12.641	56.045
Jul-04	-0.741	0.633	0.676	0.892	0.880	17.255	58.403
Aug-04	-0.620	0.711	0.603	0.966	0.847	24.603	60.204
Sep-04	-0.542	0.680	0.661	0.969	0.799	22.274	54.524

Pipeline-to-Pipeline Analysis

Only pipelines that qualify as "like" exposures can be bundled together. Thus it is important not only to understand the correlation of a given pipeline with NYMEX, but also with other pipelines as well.

We can estimate whether are exposures are "alike" by evaluating the R2's of a given pipeline against another with which we wish to combine it. The table below shows the sample pipeline data correlated against every other pipeline listed by Inside FERC. The R2 value is given for the past 12-month as well as the past 30-month period.

Cheyenne Hub Regression Analysis versus Major Pipes

Pipeline Name	R^2 1 Year	R^2 30 Month	Pipeline Name	R^2 1 Year	R^2 30 Month
Algonquin Citygate	0.072	0.464	Northwest Rockies	0.153	0.432
ANR ML 7 Eddy Zone	0.713	0.870	OHIO Transmission Oklahoma	0.875	0.805
ANR Pipeline Co. Louisiana	0.542	0.870	Panhandle Eastern Texas, Oklahoma (Mainline)	0.481	0.696
ANR Pipeline Co. Oklahoma	0.600	0.589	PG&E Citygate	0.485	0.000
Chicago LDCs Red Oven	0.519	0.879	PG&E Lg Pkgs	0.743	0.813
Colorado Inter Rocky Mountains	0.837	0.941	Questar Pipeline Rocky Mountains	0.600	0.941
Columbia Gas Appalachia	0.534	0.630	Reliant Energy East	0.903	0.799
Columbia Gulf Louisiana	0.509	0.660	Reliant Energy West	0.019	0.641
Dawn Ontario	0.373	0.681	SoCal Gas Lg Pkgs	0.875	0.775
Dominion South Point	0.500	0.620	South Louisiana Henry Hub	0.324	0.666
Fort Texas Katy	0.540	0.600	Southern Natural Louisiana	0.515	0.665
El Paso Natural Permian Basin	0.464	0.706	Tennessee Gas Pipe Texas (Zone 0)	0.581	0.665
El Paso Natural San Juan Basin	0.856	0.940	Tennessee Zone 6	0.146	0.320
Florida Gas Trans. Zone 1	0.534	0.627	Tennessee, 500 Leg	0.572	0.664
Florida Gas Trans. Zone 2	0.515	0.664	Tennessee, 800 Leg	0.540	0.663
Florida Gas Trans. Zone 3	0.501	0.671	Texas Gas Trans Zone SL 3	0.172	0.244
Houston Ship Channel Index	0.533	0.636	Texas Eastern East Louisiana	0.525	0.660
Kern River Gas Wyoming	0.856	0.942	Texas Eastern East Texas	0.521	0.592
Koch Gateway South Louisiana (Rect Sale	0.893	0.761	Texas Eastern South Texas	0.563	0.636
Main Isle FG&E	0.877	0.711	Texas Eastern West Louisiana	0.527	0.671
Michigan - Consumers	0.536	0.869	Texas Gas Zone 1	0.543	0.668
Michigan - MichCon	0.547	0.860	Texas Gas Zone SL	0.507	0.661
Mississippi River Transmission Corporation (Mainline)	0.919	0.762	Transco ST 45	0.342	0.600
Mississippi River Transmission Corporation (West Leg)	0.220	0.715	Transco Z6 (non-NY)	0.249	0.337
NG Pipeline Co. Louisiana Zone	0.918	0.842	Transco Z6 (NY)	0.000	0.433
NG Pipeline Co. Mid-Continent	0.870	0.673	Transcontinental Zone 1 (Pooling Point)	0.564	0.634
NG Pipeline Co. South Texas Zone	0.908	0.760	Transcontinental Zone 3 (Pooling Point)	0.530	0.660
NG Pipeline Co. Texas-Oklahoma Zone	0.529	0.876	Transcontinental Zone Mississippi/Alabama	0.504	0.667
Niagara - NFG Trans	0.858	0.863	Transwestern Permian Basin	0.460	0.711
Northern Natural Demarcation	0.842	0.882	Trunkline Gas Co. Louisiana	0.527	0.679
Northern Natural Texas, Oklahoma, Kansas	0.904	0.873	West Texas Waha	0.334	0.679
Northern Natural Ventura, Iowa	0.825	0.865	Williams Natural Texas, Oklahoma, Kansas	0.429	0.669
Northern Pipeline Canadian Border	0.668	0.772	ANR/SE	0.488	0.813
Northern Pipeline Rocky Mountains	0.840	0.943			