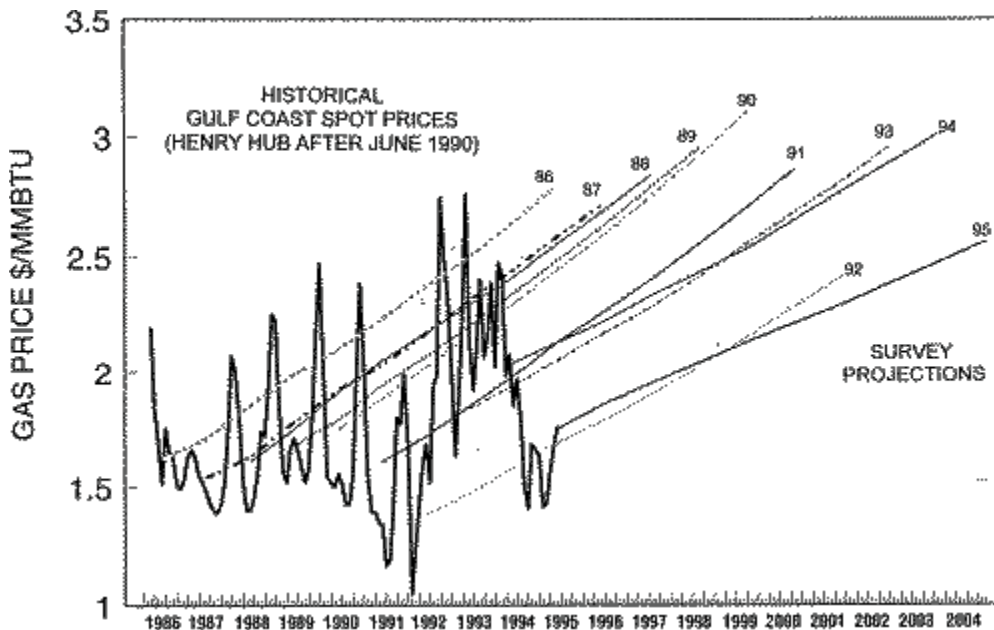
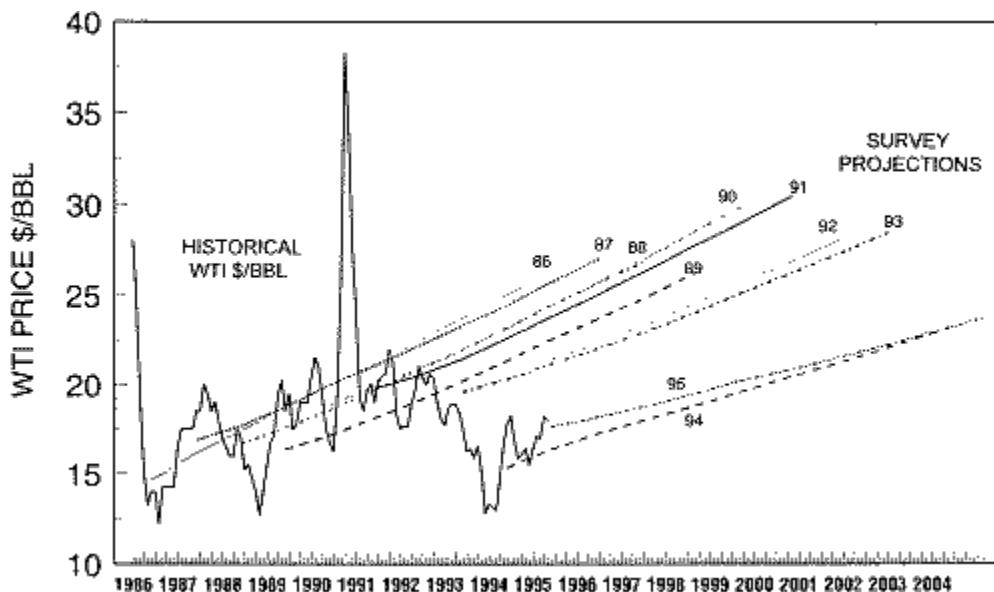


Survey of Economic Parameters Used in Property Evaluations Example Report

Survey of Gas Price Projections



Survey of Oil Price Projections



Cover Letter

FOURTEENTH ANNUAL SOCIETY OF PETROLEUM EVALUATION ENGINEERS SURVEY OF ECONOMIC PARAMETERS USED IN PROPERTY EVALUATION

June 1995

In April 1995, the Society of Petroleum Evaluation Engineers (SPEE) distributed the questionnaire for its Fourteenth Annual Survey of Economic Parameters Used in Property Evaluation. This report presents an analysis of the 214 responses received prior to May 24. Responses were received from 85 producers, 90 consultants, and 39 bankers. In previous years a separate Category of "other" has been included. This year only five "other" responses were received, including four government employees, and all five were included with statistics for consultants. The survey reflects the composite opinions of the respondents. Neither the SPEE nor its members endorse or necessarily agree with the composite opinions.

Part I of this year's survey is very similar and easily comparable to the previous thirteen surveys. Part II includes additional questions that have not previously been included in the SPEE survey. Almost 90% of the questionnaires returned included answers to the additional questions. The Evaluation Parameters Survey Committee will appreciate all comments on the additional questions, and suggestions for further changes. The SPEE Parameters Committee expresses its appreciation to **J. R. Butler and Compan** for compiling data from the respondents and preparing a report of survey results as they have done for the past thirteen years. Special appreciation is due to Dr. L. K. Nemeth who designed the original survey format and guided the survey's direction and success since its inception.

All of us who use this survey give out thanks to the respondents. Those busy professionals who take time for a timely and thoughtful response to our questionnaire are the ones who make this report possible.

Respectfully submitted,

Andrew A. Merryman
Chairman, Evaluation Parameters Survey Committee

Purpose

This survey is conducted annually by the Society of Petroleum Evaluation Engineers to obtain opinions from the evaluation community regarding a limited number of economic parameters used for evaluation of oil and gas properties in the United States and Canada. The SPEE does not endorse the use of any of the survey parameters as evaluation guidelines, but the popularity of the survey shows that the survey is relevant when used within the scope of its intended purpose.

The stated purpose of the survey is to capture and analyze, at a single point in time, a set of chronically volatile economic parameters including, among other things, projections of future oil and gas prices, drilling and operating costs, and inflation. Opinions on the factors used to recognize the risks associated with different categories and the discount factor used to calculate the present value of future cash flows are also reflected in the statistical data. This year, additional questions were added in Part Two of the survey to obtain additional information and allow a better understanding of responses to Part One.

When used with an appreciation for the purpose of the survey and the source of the statistical results, we believe this information can be useful in preparing and using evaluations of oil and gas properties. Results can be particularly useful in comparing the relative thinking of different groups, such as producers, consultants, and bankers, and in appreciating how opinions have changed over time. Care should be taken in using the information in this report for several reasons. The survey covers only a few of the many considerations of importance in the evaluation of oil and gas properties. Those that are included represent opinions for general evaluation work and may not be appropriate for any one particular evaluation. The report draws attention to the arithmetic mean for all opinions expressed by the individual respondents, and may not fully reveal the difference of opinion that may exist among the respondents.

Additionally, the responses are subject to change over time and may not be meaningful for any period other than April 1995.

Survey Summary

The industry has maintained relatively mild escalation factors for all prices and costs in the past few years. Last year's relatively more optimistic gas price forecast has taken a step back and is now similar to 1992's price pattern.

A summary of the pertinent results of the 1995 Survey is shown below:

OIL AND GAS PRICE FORECASTS

Commodity	Price		Escalation
	1995.00	2004	%/Year
Oil, \$/bbl	17.64	23.77	3.38
Gas, \$/MMBtu	1.75	2.56	4.19

COSTS AND INFLATION

Average	Annual Escalation	%/Year
Operating Cost	Drilling Cost	Inflation
3.29%	3.36%	3.35%

EVALUATION CRITERIA

Items	Mean Factor, %	
	Acquisition Value	Loan Value
Present Worth Factor (Cost of Money)	10.18	—
Rate of Return (Cost of Money Plus Return)	17.64	—
Risk Adjustments (Probability of Success)		
Proved Producing	96.29	84.04
Proved Shut-In	84.66	67.28
Proved Behind-Pipe	74.24	55.23
Proved Undeveloped	55.23	33.45
Probable Behind-Pipe	26.16	8.76
Probable Undeveloped	19.93	6.84
Possible Behind-Pipe	8.17	3.19
Possible Undeveloped	5.55	2.13

CLASSIFICATION OF RESPONSES**1. By Industry Group and SPEE Member vs. Non-Member:**

Category	Member	Non-Member	Total	%
Producer	42.00	43.00	85.00	39.70
Consultant	65.00	25*	90.00	42.10
Banker	12.00	27.00	39.00	18.20
Total	119.00	95.00	214.00	100.0

* Includes "Other" group

2. Policy Reflected by:

Category	Replies	%
Company Policy	105.00	49.10
Personal Opinion	96.00	44.80
Client's Request	10.00	4.70
No Answer	3.00	1.40
Total	214.00	100.0

3. Respondent's Job Category:

Category	Producer	Consultant	Bank	Total	%
Owner/Manager	36.00	67.00	11.00	114.00	53.30
Supervisor Level	27.00	6.00	10.00	43.00	20.10
Engineer/Geologist, etc.	18.00	14.00	14.00	46.00	21.50
Financial Specialist	2.00	0.00	1.00	3.00	1.40
Others/No Answer	2.00	3.00	3.00	8.00	3.70
Total	85.00	90.00	39.00	214.00	100.0

Details of the survey are in the body of the report. Should you require additional copies, please contact Ms. B. K. Starbuck at the SPEE office (713) 6511639. Should you need any clarification or explanation of the survey call Dr. L. K. "Les" Nemeth at (713) 9611121.

Discussion

OIL PRICE

Figure 1 shows the survey-predicted domestic crude (West Texas Intermediate) price for the next decade. Starting from \$17.64/bbl, the price reaches \$23.77/bbl in the year 2004 with an effective overall escalation rate of 3.38% per year. The mean price is plotted accompanied by confidence limits of \pm one standard deviation. The survey indicates that approximately two-thirds of the respondents believe that the oil price in the year 2004 will be between \$20.17/bbl and \$27.37/bbl. Average maximum ceiling price was predicted as \$30.58/bbl. In this figure there is a sudden bump in the middle of the prediction period. It results from one respondent whose prediction of oil price in 1999 was \$40/bbl.

Projections for the three respondent groups are summarized below and a comparison among the groups is shown in Figure 2. It is noted that starting price (\$17.64/bbl in 1995) is higher than last year (\$15.35/bbl) but the escalation rate predicted by the 1995 Survey is lower than last year. A comparison of predictions among the various industry groups is shown in tabular form below.

Oil Price Forecast By Groups

Group	Price, \$/bbl		Esc. Rate	Max. Price
	1995.00	2004.00	%/Year	(\$/bbl)
Producer	17.65	24.03	3.51	30.52
Consultant	17.78	23.82	3.35	31.10
Banker	17.29	23.05	3.19	29.47
Average	17.64	23.77	3.38	30.58

GAS PRICE

Figure 3 displays the survey-predicted mean gas price (Gulf Coast) for the next decade with the one standard deviation confidence limits shown. The price increases at an average rate of 4.19% per year, which is lower than last year but is still stronger than the predicted oil escalation rate. The maximum price (ceiling price) predicted was \$3.38/MMBtu. The curves on Figure 4 represent price estimation trends among the various industry groups. Prediction of producer and consultant groups are almost identical. A tabular comparison is shown below.

Gas Price Forecast By Groups

Group	Price, \$/MMBtu		Esc. Rate	Max. Price
	1995.00	2004.00	%/Year	(\$/MMBtu)
Producer	1.76	2.60	4.36	3.31
Consultant	1.78	2.60	4.22	3.49
Banker	1.67	2.39	3.76	3.30
Average	1.75	2.56	4.19	3.38

OPERATING AND DRILLING COSTS AND INFLATION.

There are no remarkable shifts from one group to another or between cost and inflation indicating that most respondents are apparently forecasting cost increases influenced essentially by their perception of inflation trends.

TenYear Annual Escalation (%/YEAR)

Cost	Annual Escalation Rate			
	Producer	Consultant	Banker	Average
Operating	3.18	3.47	3.13	3.29
Drilling	3.32	3.51	3.09	3.36
Inflation	3.37	3.49	2.98	3.35

Figures 5, 7 and 9 graphically display the cumulative escalation for operating costs, drilling costs and inflation, respectively. The broken lines outline the one standard deviation confidence limits for ten years of projection with 1994 being the base year.

Figures 6, 8 and 10 show the cost escalation rates predicted by the three groups.

EVALUATION CRITERIA

Table I shows compiled results of the survey evaluation criteria. This year respondents were asked to show the confidence factor used to calculate acquisition and loan value separately. As expected and as shown in Figure 11 risk adjustment of loan value is more severe than that of acquisition value.

Table II demonstrates that about 40% of the respondents would apply risk adjustments to reserve quantities while approximately 44% would apply risk adjustments only to cash flow results. Some apply the adjustment to both reserves and cash flow. Table III shows that about twothirds of the respondents apply price caps (in either a dollar value or maximum escalation time) while onethird do not utilize any price limitations. The percentage of those who apply price caps is almost identical to last year's.

Figure 11 is a graphical presentation of the risk adjustments shown on Table I. It compares adjustment factors for all groups' acquisition and loan values. "PVPD" is the abbreviation for Proved Producing, and SI, BP and UD are for Shutin, BehindPipe and Undeveloped, respectively.

Figures 12, 13, and 14 are the plots of risk adjustments for acquisition value applied by the specific groups of Producers, Consultants and Bankers. Figure 15 is the similar plot for loan value for all groups with confidence limits.

Analysis of Evaluation Criteria (in percent)

Items	Data Points	Mean Factor	Mid Point	±1 SD.
Present Worth Factor(Cost of Money)	178	10.18	12.50	1.86
Rate of Return(Cost of Money plus Return)	171	17.64	19.00	3.99

Acquisition Value Risk Adjustments*

Proved Producing	179.00	96.29	80.00	6.52
Proved Shut-In	173.00	84.66	62.50	11.57
Proved Behind-Pipe	176.00	74.24	54.00	16.68
Proved Undeveloped	175.00	55.23	50.00	23.06
Probable Behind-Pipe	165.00	26.16	37.50	21.88
Probable Undeveloped	163.00	19.93	37.50	18.66
Possible Behind-Pipe	161.00	8.17	25.00	10.94
Possible Undeveloped	161.00	5.55	25.00	8.46

Loan Value Risk Adjustments*

Proved Producing	104.00	84.04	70.00	18.09
Proved Shut-in	99.00	67.28	50.00	25.50
Proved Behind-Pipe	99.00	55.23	50.00	28.16
Proved Undeveloped	99.00	33.45	42.50	28.01
Probable Behind-Pipe	91.00	8.76	35.00	18.68
Probable Undeveloped	91.00	6.84	30.00	15.23
Possible Behind-Pipe	90.00	3.19	20.00	8.73
Possible Undeveloped	90.00	2.13	15.00	6.51

Risk Adjustment Applied to:

Category	Replies	%
Reserves	85.00	39.70
Cash Flow	93.00	43.50
Reserve & C. F.	8.00	3.70
No Answer	28.00	13.10
Total	214.00	100.0

Preference of Price Cap:

	Preference of Ceiling Price	Average Ceiling Price
Oil	74.3%	\$30.58 ± 10.71/bbl
Gas	66.8%	\$3.38 ± 1.16/MMBtu

PRICE/COST ESCALATION RATES

The price and cost data have been analyzed in an additional way. Figure 16 is a frequency distribution showing oil price escalation during the 10year forecast period. Onethird of the respondents utilized in the neighborhood of a three percent per year rate increase.

Figures 17, 18, and 19 are similar histograms for gas price, operating and drilling costs, respectively. The escalation rate statistics are shown in a tabular form below: The price and cost data have been analyzed in an additional way. Figure 16 is a frequency distribution showing oil price escalation during the 10year forecast period. Onethird of the respondents utilized in the neighborhood of a three percent per year rate increase.

Figures 17, 18, and 19 are similar histograms for gas price, operating and drilling costs, respectively. The escalation rate statistics are shown in a tabular form below:

Price-Cost	No. of Data Points	Escalation Rate %/Year	
		Median	Mode
Oil Price	212.00	3.0	3.0
Gas Price	203.00	4.0	4.0
Operating Cost	186.00	3.0	3.0
Drilling Cost	186.00	3.0	3.0
Inflation	186.00	3.0	3.0

The histogram for inflation is similar to that of the drilling cost, but no plot was generated.

PREVIOUS SURVEYS

Thirteen previous surveys are available for comparison purposes. In 1982, the first survey was conducted in which 1991 oil and gas prices of \$60/bbl and \$9.00/MMBtu, respectively, were predicted.

Figure 20 shows oil price forecasts since 1982 with the background of posted price for West Texas Intermediate. Figure 20a shows gas price forecasts since 1982 with the background of average wellhead USA gas prices. The large disparity noted in the early 1980s reflects the fact that the average includes contractcontrolled gas prices while the forecasts were assuming gas to be sold from new drilling at deregulated prices. Figure 20b compares forecast profiles to average spot gas prices since 1985. Figures 21 through 24 present these comparisons for oil and gas prices and costs.

This is the fourteenth survey and analysis of the price and cost escalations of the oil industry. It should be noted that past predictions of prices and costs have been inaccurate to varying degrees.

Presented below are detailed tables of numerical values for each year during prediction period by all groups (summary).

1995 SPEE Survey of Economic Parameters

CATEGORY: SUMMARY

No. of Responses: 214

Analyzed by: J. R. Butler and Company

Year	2. Oil Prices, \$/bbl	3. Gas Prices, \$/MMBtu
Year	Posted WTI	Gulf Coast Spot
1995.00	17.64	1.75
1996.00	18.19	1.86
1997.00	18.80	1.95
1998.00	19.50	2.04
1999.00	20.26	2.13
2000.00	20.83	2.21
2001.00	21.53	2.29
2002.00	22.24	2.38
2003.00	23.01	2.47
2004.00	23.77	2.56
Max Price	30.58	3.38

Operating & Development Costs And Inflation Rate

ANNUAL ESCALATION, %/YEAR			
Year	OP-Cost	Drill	Inflation
1995.00	2.78	2.84	2.98
1996.00	3.21	3.31	3.25
1997.00	3.29	3.38	3.31
1998.00	3.32	3.41	3.36
1999.00	3.34	3.41	3.39
2000.00	3.37	3.44	3.42
2001.00	3.39	3.45	3.44
2002.00	3.38	3.45	3.46
2003.00	3.38	3.45	3.46
2004.00	3.40	3.47	3.46

Summary of Part Two: Optional

Questions Included in 1995 Survey

1. If Risk Adjustment (Part One) is applied to Cash Flow, are P&A costs risked?

Risk	Total		Producer		Consultant		Banker	
	Percent	Replies	Percent	Replies	Percent	Replies	Percent	Replies
Yes	25.7	55	27.1	23	17.8	16	41.0	16
No	39.7	85	40.0	34	46.6	42	23.1	9
No Answer	34.60	74.00	32.90	28.00	35.60	32.00	35.90	14.00
Total	100.0	214.00	100.0	85.00	100.0	90.00	100.0	39.00

In Part One less than 50% of the respondents indicated a preference for risking cash flow, yet almost twothirds responded to this question in Part Two. These answers indicate a wide divergence on how to evaluate P&A costs as an increasingly important component of cost related to oilfield operations.

2. What is the basis for determining Cost of Money?

Cost based on	Total		Producer		Consultant		Banker	
	Percent	Replies	Percent	Replies	Percent	Replies	Percent	Replies
Bank Loan	38.3	82	34.1	29	36.7	33	51.3	20
Mezzanine	3.3	7	2.4	2	2.2	2	7.7	3
WACOC*	22.9	49	30.6	26	22.2	20	7.7	3
Other	14.0	30	15.3	13	12.2	11	15.4	6
No Answer	21.50	46.00	17.60	15.00	26.70	24.00	17.90	7.00
Total	100.0	214.00	100.0	85.00	100.0	90.00	100.0	39.00

* Weighted Average Cost of Capital

Previous surveys have included a question about the normal or primary present worth factor (Cost Of Money). This question allows respondents to provide additional information indicating if their answer is based on bank borrowing rates, mezzanine lender rates, weighted average costs of capital, or other. Over 80% of the producers answered this question and indicated an almost even split between the use of bank lending rates and weighted average costs of capital.

3. If minimum rates of return (ROR) are different, what is the minimum expected for the following?

BF IT ROR%	Average ROR Percent from Responses			
	Total	Producer	Consultant	Banker
Acquisition	17.6	18.0	17.1	17.9
Exploration	44.6	37.4	55.5	31.4
Development	24.7	24.9	24.9	22.9

BF IT Responses	Total		Producer		Consultant		Banker	
	Percent	Replies	Percent	Replies	Percent	Replies	Percent	Replies
Acquisition	45.3	97	52.9	45	48.8	44	20.5	8
Exploration	38.3	82	47.1	40	38.9	35	18.0	7
Development	40.2	86	48.2	41	42.2	38	18.0	7
No Answer	47.20	101.00	32.90	28.00	46.70	42.00	79.50	31.00

AF IT ROR%	Average ROR Percent from Responses			
	Total	Producer	Consultant	Banker
Acquisition	13.0	12.8	13.6	10.0
Exploration	23.5	23.7	24.2	15.0
Development	16.4	16.9	16.1	10.0

AF IT Responses	Total		Producer		Consultant		Banker	
	Percent	Replies	Percent	Replies	Percent	Replies	Percent	Replies
Acquisition	15.9	34	24.7	21	13.3	12	2.6	1
Exploration	12.6	27	20.0	17	10.0	9	2.6	1
Development	14.5	31	23.5	20	11.0	10	2.6	1
No Answer	84.10	180.00	75.30	64.00	86.70	78.00	97.40	38.00

It was anticipated that respondents using a single expected rate of return for all investments would not answer this question. Over two-thirds of the producers responded by noting the different rates of return used for analysis before income tax, but less than 25% of producers provided information on after tax analysis. Total replies and percentages are not provided because each respondent provided multiple answers. The survey shows that all groups require higher rates of return for exploration, with consultants having the highest requirements.

4. What is the level of total acquisitions consummated in 1995 for which respondent has personal knowledge?

Transactions Millions \$	Total		Producer		Consultant		Banker	
	Percent	Replies	Percent	Replies	Percent	Replies	Percent	Replies
Less than 1	7.9	17	8.2	7	10.0	9	2.6	1
1 to 20	29.9	64	34.1	29	34.4	31	10.3	4
More than 20	40.2	86	40.0	34	31.1	28	61.5	24
No Answer	22.0	47.00	17.70	15.00	24.50	22.00	25.60	10.00
Total	100.0	214.00	100.0	85.00	100.0	90.00	100.0	39.00

This question helps gain an understanding of the level of activity in acquisitions and divestitures. Over 80% of the producers responded with indications that most had personal knowledge of transactions totaling more than \$1 million.

5. Are "futures prices" considered in making price projections?

Futures used in Price Proj	Total		Producer		Consultant		Banker	
	Percent	Replies	Percent	Replies	Percent	Replies	Percent	Replies
Yes	51.9	111	52.9	45	44.5	40	66.7	26
No	37.4	80	37.7	32	43.3	39	23.1	9
No Answer	10.70	23.00	9.40	8.00	12.20	11.00	10.20	4.00
Total	100.0	214.00	100.0	85.00	100.0	90.00	100.0	39.00

Answers to this question show that about 90% of the respondents were interested in this question. A clear majority of producers and bankers are now using "futures prices" to assist in making price projections.

6. Does respondent's company use futures or OTC derivatives to hedge prices?

Hedge Prices	Total		Producer		Consultant		Banker	
	Percent	Replies	Percent	Replies	Percent	Replies	Percent	Replies
Yes	25.7	55	38.8	33	14.4	13	23.1	9
No	39.7	85	44.7	38	38.9	35	30.7	12
N/A	18.2	39	5.9	5	27.8	25	23.1	9
No Answer	16.40	35.00	10.60	9.00	18.90	17.00	23.10	9.00
Total	100.0	214.00	100.0	85.00	100.0	90.00	100.0	39.00

Almost 90% of the producers provided answers to this question. The responses indicate that about 40% of the producers currently have some portion of their production hedged.

7. What percent of oil and gas production is currently hedged?

Oil Production Hedged	Total		Producer		Consultant		Banker	
	Percent	Replies	Percent	Replies	Percent	Replies	Percent	Replies
Yes	24.3	52	42.4	36	12.2	11	12.8	5
Unknown	15.4	33	20.0	17	14.4	13	7.7	3
No Answer	60.30	129.00	37.60	32.00	73.40	66.00	79.50	31.00
Total	100.0	214.00	100.0	85.00	100.0	90.00	100.0	39.00

Gas Production Hedged	Total		Producer		Consultant		Banker	
	Percent	Replies	Percent	Replies	Percent	Replies	Percent	Replies
Yes	24.8	53	43.5	37	11.1	10	15.4	6
Unknown	15.9	34	20.0	17	15.6	14	7.7	3
No Answer	59.30	127.00	36.50	31.00	73.30	66.00	76.90	30.00
Total	100.0	214.00	100.0	85.00	100.0	90.00	100.0	39.00

Answers to this question indicate that producers use hedging for oil and gas somewhat equally. Not only did about 40% of the producers report use of hedging products, they also report that about 40% of their production was hedged.

SPEE Survey

