RISKS, STRATEGIES, AND UTILIZATION OF INTEREST RATE SWAPS IN THE PETROLEUM INDUSTRY

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While breakdowns in the management of environmental risks of petroleum production can be threatened by severe weather or a lack of proper maintenance, oil and gas companies can be just as susceptible to the perilous combination of adverse economic events and faulty risk management practices in financial operations. To hedge against some of these financial risks, many petroleum companies have significantly increased their dependence on derivatives as risk management tools over the last several years. Globally, the derivatives market is expanding and was estimated at over $36 trillion in 1995 [Dubina and Unger, 1995]. Within the oil and gas industry alone, there has been a dramatic eight-fold increase in the utilization of derivatives over the period from 1988 to 1995, with the 1995 market estimated at greater than $40 billion [PR Newswire Association, December 19, 1995].

Included under the broad umbrella term "derivatives" are many different types of transactions that can take on a variety of forms, such as interest rate swaps, currency swaps, futures contracts, collateralized mortgage obligations, dual index floaters, and reverse repurchases. The most widely used contract, however, is the interest rate swap. In a recent Price Waterhouse survey, 80% of the largest petroleum companies indicated that they employed some form of derivatives as risk management tools, and the majority of those contracts, or 53%, were interest rate swaps [Lande, 1994].

While interest rate swaps may be used by petroleum companies to effectively manage or reduce the sensitivity or exposure of earnings to interest rate fluctuations, the practice of employing these instruments is not without risk. In addition to establishing overall strategic financial plans for the company (which include the use of these types of derivatives), petroleum firms must also formulate strategies to capture and reduce the adverse dimensions of interest rate swap risks. The purpose of this paper is to: (1) discuss risks related to interest rate swaps, (2)

consider their relationships to strategies undertaken by the oil and gas industry, and (3) explore a sample of interest rate swap disclosures for petroleum companies in an effort to identify industry risk management alignment trends for maximizing net interest income while maintaining acceptable levels of interest rate sensitivity.

General Risks to Be Considered in Strategy Formulation Associated With Interest Rate Swaps

Risks associated with interest rate swaps can be: (1) explicit, which is the risk to the underlying cash instrument; (2) implicit, where the risks are not functions of the underlying instrument but instead are created by the market structural designs; and (3) perceived, which are risks arising from imperfect information and the ability of market participants to assess and interpret the information. The last category of risk embodies three basic subcategories which are: accounting risk, disclosure risk, and educational risk [Gibson and Zimmermann, 1994].

The strategies of managing and utilizing interest rate swaps focus predominantly on the last two risks since the explicit risks associated with the underlying cash instruments are not new, are generally denominated in the same currency, and primarily result in a zero sum game. Put another way, in a basic interest rate swap agreement, each of two companies service the other's interest payments, trading fixed for floating rates, throughout the life of the loans, and there is no exchange of principal repayment obligations in the swap. Neither lender of the loans is a party to the swap, and each borrower continues to be obligated to its own lender for the payment and original terms of both principal and interest. In fact, the lenders do not necessarily know that the swap has taken place.

Implicit risks, which embody credit and default, liquidity, settlement, operational, and legal risks must be addressed by the financial management strategies of petroleum companies involved in swaps. This is achieved through the examination of the existence of market frictions and comparative advantages of other institutions. Sound pricing models serve as efficient risk management tools in these areas, as long as they are based on an adequate system for defining and reinforcing benchmark risk exposures. These benchmarks include: defining a functional relationship with respect to the duration of the swap, diversification of swaps, an optimal degree of market risk exposure for the institution, and a global portfolio view of target risks rather than individual swaps or transactions.

More specifically, the measurement and management of credit risk in these models must address the default risk of a loss incurred on a swap if the counterpart

is unable to honor its agreement. One recent study suggests that some companies fail to assess default risk correctly because they rely on traditional ratings and current credit risk exposure while failing to look at the expected evolution or probability of default dynamics over time [Grunbichler, Longstaff, and Schwartz, 1994]. Management strategies must also focus on liquidity risk, which is generally defined as the ease with which a specific financial instrument can be traded. It is a function of cost, time, and innovation. Thus, the more time it takes and/or the more costly it is to complete the swap, the less liquid the contract. The innovativeness in the design of the interest rate swap, which is the key to reducing transaction costs and time necessary to enter these contracts, also promotes increased liquidity among market participants.

Consideration of interest rate swap usage by a petroleum firm also centers on settlement risks, which include the sensitivity of changes in interest rates, the exposure to changes in future cash flows, and intermediary commissions [Ray, 1989]. Issues such as coordination between the party originating the swap and the party responsible for reporting the swap are among the most important operational risks for an overall financing strategy in oil and gas firms and are best managed by instituting proper internal control or oversight procedures [Winograd and Herz, June 1995; McClintock, March 1996]. Legal risks are also major focus areas in these agreements and result from the possibility that swaps will be challenged as illegal or will be declared null and void by the courts. These risk considerations include the uncertainty surrounding early termination of swap contracts and a lack of legal precedents concerning the requirement or value of default collateral assumed by some intermediaries to interest rate swaps [Felgran, 1987; Friedman and Joseph, 1993]. Legal concerns are particularly important in the oil and gas industry, given the report by Winograd and Herz [June 1995], which indicates that a number of companies have not been successful in their suits to enforce swap agreement terms against counter parties, especially in government or regulated industries.

Risk management and risk reduction strategies must also focus on the perceived risks of accounting, disclosure, and education in accessing and evaluating relevant information related to interest rate swap contracts. Currently, petroleum companies are plagued by a deficiency of accounting standards and disclosures globally, across industries, and within the industry to allow for firm comparisons, proper collateralization, adequate frequency in the monitoring of value and profitability, and dynamic market, liquidity, and credit risk assessment. While the FASB is continuing to address some of these issues with its new

exposure draft [FASB, Exposure Draft, June 20, 1996], the quality and quantity of information remains insufficient and persists as a major source of estimation risk associated with oil and gas company strategies. With regard to the educational risk, Bullen [1994] suggests that interest rate swaps have become too integral a part of the petroleum industry to be left to financial managers. Despite the fact that most of the present directors and senior managers completed their formal education and developed hands-on knowledge about their industry before the development of these financial instruments, all three groups need to take on the responsibility of education, formulation of overall swap policies, and provide information about these derivatives to all parties that require it in order to exercise their responsibilities and decision-making options.

Strategies Used to Manage Risks Associated With Interest Rate Swaps

Risks are an inherent part of all financial decisions. Interest rate swaps are particularly attractive in the oil and gas industry as financial tools because they provide flexibility for more efficient allocation of financial and economic risks. In the previous section, various risks were identified as endemic concerns for petroleum companies involved in the interest rate swap market. Companies guard against these vulnerabilities by formulating risk management strategies, which are financing strategies used to reduce the variance of a firm's profitability while minimizing adverse effects of interest rate swap risks.

Oil companies have been changing their risk management from a traditional tactical approach to the strategic control of multiple risks, where the variable of primary concern is net income [Burchett, 1994]. It is important to note that companies in the same industry should not necessarily adopt the same risk-management strategies. Even though all oil companies are exposed to similar oil-price and interest rate risk, some may be exposed more than others in both their cash flows and their investment opportunities.

Optimal decisions for risk management are further complicated by the considerable number of strategy choices as well as the individual firm characteristics and corporate objectives. Some of the more common corporate financing strategies utilized by many oil and gas firms involved in the interest rate swap market are summarized below:

- Titman (1992) suggests that the strategies of many firms in using the swap market is to alter the duration of their liabilities as they pertain to the following issues.

(1) Costs associated with financial distress provide an incentive for some firms to reduce uncertainty about their future interest expenses.

(2) Asymmetric information is an incentive for the more highly valued firms to borrow short-term so that they can take advantage of opportunities to borrow under more favorable terms in the future. This asymmetric information is enhanced in situations where firms are swapping fixed for floating. Put another way, firms swapping fixed obligations for floating rate obligations are, on average, riskier than those that swap floating for fixed.

(3) Lower rated firms that expect their credit ratings to improve in the future prefer to borrow short-term and swap a floating for a fixed rate. This suggests that, on average, lower rated firms that initiate such transactions should experience a subsequent increase in their value.

(4) Lower rated firms that expect their credit ratings to deteriorate in the future will want interest obligations determined in advance and should borrow either long-term or with a floating rate note. Firms that secure these arrangements frequently experience subsequent declines in value.

- Burchett (1994) reports that many other firms are using some of the following strategies.

(1) Integrated structures can be used to link interest expenses to energy-based profits. For example, an oil refiner can tie its floating interest rate charges to the company's gross profit margin. This "crack spread," as it is called, tends to determine cash flow and the ability to service interest rate payments. In custom-made swaps, the interest rate is positively indexed to its crack spread, and if the company's profits decline, a welcome reduction in interest rate occurs.
(2) Other integrated structures exist where some energy companies may want protection similar to the previously mentioned integrated instrument, but without paying a premium. In such cases, a company can agree to give up some of the upside when refining margins increase by paying a higher interest rate.

(3) Multi-factor caps or knockouts can set a ceiling on interest rates and offer up to a 30% savings on the up-front payment for interest rate protection. For example, an oil producer can use a knockout with a

standard interest rate cap that is knocked out in any biannual period during which oil prices exceed an agreed-upon level. In this case, the producer can then stay in floating rates to benefit from low, short-term interest rates and still have protection against increases in funding costs. Knockout protection is eliminated if oil prices rise but the increase in revenues will maintain profits even if interest costs rise.

(4) One-touch knockouts can also be designed to eliminate the rate cap for the remaining term if oil prices reach a given level on a given day. However, most producers use knockouts based on average oil prices over each biannual period with the elimination of interest rate protection only for the period in which revenues exceed a given barrier.

(5) Semi-fixed swaps directly link interest expenses to oil or gas revenues. These swaps guarantee specific interest rates for a defined range of oil or gas prices. For example, a fixed interest of 6% on an agreed dollar amount is locked in during those quarters for which the average daily spot crude prices remain below, say, $25/barrel. The 6% rate would be lower than the market rate of 6.5% during periods where oil was below the $25 trigger. However, when oil exceeds the $25 barrier, the semi-fixed interest rate would increase to maybe 7%, but so would the producer's revenues, making the higher interest servicing costs negligible.

- Howe (1992) describes incorporating the following strategies into financial risk management plans used by petroleum firms.

  (1) If a firm is experiencing a lack of protection in the case of a decline in rates, while paying fixed and receiving floating rates, the solution could be to purchase a callable swap. This swap has an attached or early termination clause which will be more expensive due to higher fixed rates paid and termination fees. However, if the current risk is unacceptable, it is worth buying this protection.
  (2) Dedication is a strategy whereby financial managers can assign an outgoing "home" for each incoming cash flow, or dedicate the asset stream of one swap to the liability stream of another swap. In this strategy, swaps are being purchased as much for their payment dates as their credit quality and interest rate.

(3) Stacking is also another strategy whereby a financial manager could purchase a series of interest rate swaps based on a floating rate and, as time goes on, additional amounts could be added to or subtracted from the closest-to-maturity or front-month contract.

(4) Entering more swaps as a strategy is similar to situations with a floating rate asset, fixed rate obligations, and declining interest rates. If the rates have already moved, waiting to swap will make the protection too expensive, and no one will want to take the other side of the trade. However, entering another swap at the inception to receive fixed and pay floating, will fix the obligation cost, and the payments will be the index that matches the assets whose cash flows are earmarked to the liability.

- Antl (1988) also notes that corporate strategies take advantage of the mechanism of interest rate collars in their agreements. These are variations of the cap agreement whereby the seller agrees to limit the borrower's floating interest rate to a band limited by a specified ceiling rate and floor rate. When market rates are between the floor and ceiling, the borrower pays the market rates. If the market rate exceeds the ceiling, then the seller will make payments to the buyer so that the rate will not exceed the specified ceiling. If the market rates fall below the floor, the borrower makes payments to the collar seller to bring the rate back to the floor. Using this agreement as a strategy is extremely popular because of the reduction in premium. In other words, while the risks of higher rates is protected and some of the potential gains for lower rates is foregone, the buyer of the collar accepts a maximum gain if rates fall.

Study of Petroleum Companies Using Interest Rate Swaps

Although oil companies are reluctant to reveal their proprietary secrets with respect to interest rate swap trading strategies, financial statement disclosures can provide some information into the general trends occurring within the industry. The following section contributes some insight into a sample of petroleum companies and their interest rate swap transactions with respect to: (1) the impact of changes directly associated with interest rate swaps which transform from: (a) a fixed to variable rate or (b) a variable to fixed interest rate; (2) the characteristics of companies committed to both kinds of swaps; and (3) other financial ratios or

variables as indicators of the kinds of swaps undertaken and/or the impact on individual companies.

Financial statement data for the analysis was retrieved from the AR annual report file from 7/84 to 6/94 of the National Automated Accounting Retrieval System (NAARS). The search words in this study, "SIC (=131 or =132 or =138 or =291 or =295 or =299) and interest rate swaps," were constructed to identify data with the greatest number of oil and gas companies involved with interest rate swap reporting and resulted in a total of 65 disclosures for the final analysis. Additionally, data pertaining to thirty-five financial variables were also collected or computed from the financial statements and used in the analysis. These variables are listed in Table 1.

Table 1
Variable Used in Study

1. Notional amount
2. Fair value of swap
3. Number of months in swap
4. Increase/decrease in interest expense
5. New interest rate paid
6. Old interest rate before swap
7. Total assets
8. Total liabilities
9. Long-term debt
10. Interest payable
11. Total equity
12. Total shares of stock outstanding
13. Net income or loss
14. Net income before interest and taxes
15. New interest rate/old interest rate
16. Notional amount/total liabilities
17. Notional amount/long-term debt
18. Notional amount/total equity
19. Notional amount/net income
20. Notional amount/income before interest and taxes
21. Interest payable/total liabilities
22. Interest payable/long-term debt
23. Interest payable/total liabilities
24. Interest payable/net income
25. Interest payable/income before interest and taxes
26. Notional amount/fair value of swap
27. Long-term debt/total equity
28. Long-term debt/total assets
29. Total liabilities/total assets
30. Total equity/shares outstanding
31. Net income/shares outstanding
32. Net income/total assets
33. Net income/total equity
34. Income before interest and taxes/total equity
35. Long-term debt/total liabilities

Because reporting inconsistencies and missing data are characteristic of disclosures related to interest rate swaps, the exploratory investigation of existing data was achieved through means testing analyses utilizing the t-test. In a comparison of the means of variables for companies committed to an interest rate swap which transformed a fixed to variable rate versus a variable to fixed interest rate, there were several variables exhibiting significant differences (based on a probability of .05 or less) between the two groups. In addition, some variables presented marginally significant differences (based on a probability of .051 to .102) between the two groups. The remaining variables presented no significant differences between the two groups. The t-test results for variables presenting significant differences are presented in Table 2, along with the means and standard deviations for each variable. Table 3 shows the same information for variables presenting marginally significant differences, and Table 4 presents information for the non-significant variables.

Table 2
Descriptive Statistics—Statistically Significant Variables

Variable	Swap From/To	N	$\bar{x}$	SD	t	p
Notional amount ($000's)	V to F	37	444429	868944	2.19[b]	.035
	F to V	21	128023	99581		
New interest rate paid	V to F	29	8.17	1.93	2.65[a]	.005
	F to V	6	5.49	2.32		
New interest rate-old interest rate	V to F	4	0.93	2.49	3.41[a]	.008
	F to V	5	-3.79	1.36		
Notional amount/net income	V to F	37	3.53	7.86	2.59[a]	.012
	F to V	21	-.83	4.97		
Interest payable/income before interest and taxes	V to F	12	0.10	0.13	2.69[a]	.026
	F to V	4	-0.05	0.08		

a = equal variances; b = unequal variances; v = variable; f = fixed
Note: The Levine procedure was used to test the null hypothesis of equality in population variances (Ho: $\sigma^2_1 = \sigma^2_2$). If differences in the sample variances are sufficiently large to reject the hypothesis, then probabilities are based on a model of unequal variances. The equal variance model is slightly more efficient; however, the differences are typically small. For a full discussion, see W.L. Hayes, *Statistics*, 3rd edition. New York: Holt, Rinehart, and Winston, 1981.

As noted in Table 2, significant statistical differences occur between companies electing a fixed to variable interest payments exchange versus a variable to fixed rate with respect to: (1) *the notional amount*, with the swappers to fixed rate having a mean notional amount which is approximately 3.5 times (444,429/128,023) higher than swappers to a variable rate; (2) *the new interest rate*, with swappers to a fixed rate having a mean rate which is approximately 2.7 percent (8.17% - 5.49%) higher than swappers to a variable rate; (3) *the difference between the new and old interest rate*, with swappers to a variable rate decreasing the interest rate by a mean of approximately 3.8 percent while swappers to a fixed rate acquired an increase of approximately 1 percent; (4) *the notional amount as a percentage of net income*, with swappers to a fixed rate having a mean notional amount that is 3.5 times net income versus swappers to a variable rate having a negative ratio indicative of both a much smaller notional amount (over four times smaller that swappers to fixed) and net losses as a characteristic; and, (5) *interest payable as a percentage of income before interest and taxes*, with swappers to a fixed rate having a mean of 10 percent indicating a higher percentage of interest payable and positive income versus swappers to variable with a mean of a negative 5 percent indicating less interest payable and losses before interest and taxes.

Table 3
Descriptive Statistics—Marginally Significant Variables

Variable	Swap From/to	N	$\bar{x}$	SD	t	p
Fair value of swap ($000s)	V to F	13	-4027	13790	-1.80[b]	.088
	F to V	8	4301	7392		
Notional amount/total liabilities	V to F	37	0.16	0.18	1.87[a]	.067
	F to V	21	0.09	0.10		
Notional amount/total equity	V to F	37	0.29	0.32	1.66[a]	.102
	F to V	21	0.17	0.21		

a = equal variances; b = unequal variances; v = variable; f = fixed
Note: The Levine procedure was used to test the null hypothesis of equality in population variances (Ho: $\sigma^2_1 = = \sigma^2_2$). If differences in the sample variances are sufficiently large to reject the hypothesis, then probabilities are based on a model of unequal variances. The equal variance model is slightly more efficient; however, the differences are typically small. For a full discussion, see W.L. Hayes, *Statistics*, 3rd edition. New York: Holt, Rinehart, and Winston, 1981.

Table 4
Descriptive Statistics—Variables not Statistically Significant

Variable	Swap From/to	N	$\bar{x}$	SD	t	p
Number of months swapped	V to F	28	42.11	26.86	-.03[a]	.977
	F to V	17	42.41	37.24		
Increase or decrease in interest expense*	V to F	2	1974.00	2152.43	1.97[a]	.148
	F to V	3	-2567.67	2998.55		
Old interest rate before swap	V to F	4	7.81	1.785	0.36[a]	.735
	F to V	14	7.44	2.029		
Total assets*	V to F	42	9281791	1649672	-0.30[b]	.763
	F to V	23	10422357	13546797		
Total liabilities*	V to F	42	6073680	9951358	-.040[a]	.692
	F to V	23	7070230	9438353		
Interest payable	V to F	12	57084	61947	0.60[a]	.576
	F to V	4	35652	62360		
Long-term debt*	V to F	42	19238047	24157413	-0.50[a]	.621
	F to V	23	250786	591452		
Total equity*	V to F	42	31716833	6338753	-0.11[b]	.911
	F to V	23	319595	4206489		
Total shares of stock outstanding	V to F	41	192711312	335798282	-0.13[b]	.899
	F to V	22	202153027	246710250		

Table 4, continued

	Swap From/to	N	$\bar{x}$	SD	t	p
Notional amount/fair value of swap	V to F	13	1068.06	4304.44	0.75[b]	.467
	F to V	8	167.69	337.68		
Long-term debt/total assets	V to F	42	0.31	0.16	1.49[a]	.141
	F to V	23	0.26	0.10		
Total liabilities/ total assets	V to F	42	0.66	0.17	0.58[a]	.564
	F to V	23	0.64	0.12		
Total equity/ shares outstanding	V to F	41	0.05	0.21	0.88[a]	.386
	F to V	22	0.02	0.02		
Net income/ shares outstanding	V to F	41	0.005	0.025	1.12[a]	.269
	F to V	22	0.001	0.002		
Net income/ total assets	V to F	42	0.003	0.10	-0.12[a]	.905
	F to V	23	0.005	0.04		
Net income/ total equity	V to F	42	-0.17	1.08	-0.92[a]	.365
	F to V	23	-0.01	0.16		
Income before interest and taxes/total equity	V to F	42	0.03	0.87	-0.82[a]	.414
	F to V	23	0.15	0.24		
Long-term debt/ total liabilities	V to F	42	0.47	0.19	1.60[a]	.115
	F to V	23	0.40	0.13		
Income before interest and taxes	V to F	42	682973	1565527	1.03[b]	.307
	F to V	23	394261	679828		
Notional amount/ long-term debt	V to F	37	0.34	0.32	1.48[a]	.146
	F to V	21	0.23	0.26		

Table 4, continued

	Swap From/to	N	$\bar{x}$	SD	t	p
Notional amount/income before interest and taxes	V to F	37	1.51	2.20	0.46[a]	.646
	F to V	21	0.94	5.33		
Interest payable/long-term debt	V to F	12	0.042	0.055	1.59[a]	.136
	F to V	4	0.016	0.010		
Interest payable/ total equity	V to F	12	0.043	0.056	1.31[a]	.210
	F to V	4	0.019	0.016		
Interest payable/ net income	V to F	12	0.31	0.94	1.22[a]	.247
	F to V	4	-0.03	0.09		

* = $000's; a = equal variances; b = unequal variances; V = variable; F = fixed
Note: The Levine procedure was used to test the null hypothesis of equality in population variances (Ho: $\sigma^2_1 = \sigma^2_2$). If differences in the sample variances are sufficiently large to reject the hypothesis, then probabilities are based on a model of unequal variances. The equal variance model is slightly more efficient; however, the differences are typically small. For a full discussion, see W.L. Hayes, *Statistics*, 3rd edition. New York: Holt, Rinehart, and Winston, 1981.

Table 3 shows the marginally significant statistical differences that occur between companies electing a fixed to variable interest payments exchange versus a variable to fixed rate with respect to: (1) *fair value of the swap*, (2) *the notional amount as a percentage of total liabilities*, and (3) *the notional amount as a percentage of total equity*. In the case of the fair value of the swap, swappers changing to fixed rates tended to have a mean net payable position as a result of swaps at the end of the accounting period of approximately $4.027 million. Conversely, swappers changing to variable rates during this period had net receivable swap positions with a mean of $4.301 million, which highlights differential considerations of the two types of swappers, including more risk exposure and the potential for greater cash flows available to swappers to variable rates. With respect to the notional amount as a percent of total liabilities, swappers to fixed rates had a larger mean of 16 percent versus the swappers to

variable interest rates with 9 percent. Relatedly, the notional amount as a percent of total equity also placed swappers to fixed rates with a greater mean of 29 percent as compared to the swappers to variable rates of 17 percent.

Table 4 presents the descriptive statistics for variables that are not considered statistically significant.

While more sophisticated analyses of these relatively new transactions are warranted, several general conclusions can be summarized about the financial statement data, strategies, and trends taking place in the oil and gas industry with respect to interest rate swaps.

1. In many cases, current accounting standards were not being complied with to the extent intended, disclosures lacked standardization and complete information, and the needed information to assess impacts and risk was difficult or impossible to locate in the disclosures.
2. Greater exposure of larger notional amounts to uncertain interest rate environments is associated with strategies of swapping to less risky fixed interest positions, where potential losses will be less material and cash flows are guaranteed.
3. Overall, the petroleum companies in the sample paid a higher premium of 2.7% interest for guaranteed interest rates as compared to swappers to variable rates.
4. More risky firms, as indicated by corresponding net losses, are associated with switches from fixed to variable rates. This is consistent with the fact that they tend to have weaker asset quality, are more capital-constrained, and as a result have more taste for risk.
5. Firms with larger interest payables overall and positive operating incomes figures are more likely to pursue strategies of financial management swapping of floating to fixed rates. Firms with smaller interest payables and operating losses are more likely to pursue fixed to floating swaps.
6. The greater risks of fixed to variable swaps are met by greater realized yields during periods of decreasing to stable interest rates and exploiting short-term market imperfections or arbitrage strategies. In general, the data in this study reflect a time period of a positively sloped yield curve

which has enabled a wide range of oil and gas companies with lower credit quality to boost profitability and overall financial strength without incurring greater credit risk.

7. Material notional amounts of the underlying contracts for variable to fixed swappers in the petroleum industry exist on average at three and a half times that of their net income.

8. Issues such as the duration of the swap, the asset/liability mix of the firms, leverage, or size of the firms are not statistically different for oil and gas companies choosing between the two types of swaps. The interest spread and extent of the underlying debt associated with the swap as it compares to the financial structure and risk or financial distress of the company is significant in the choice of swap types.

9. On average, the difference between the new and old interest rate of the swap indicated that swappers to fixed interest payments sacrificed less than 1% interest on contracts to guarantee cash flows.

10. The notional amount of the underlying contract is a greater average percentage of both total liabilities and total equity for swappers to fixed interest payments. On average, swappers to fixed have underlying securities which make up 16% of the total liabilities as compared to 9% for swappers to floating rates. In addition, the notional amount expressed as a percentage of total equity is an average of 12% greater for contracts to fixed than contracts to floating rates.

Conclusions

Oil companies crave price stability so that they can be sure of making safe, long-term plans about investment in new oil and gas developments. Volatility in interest rates can create excessive financial exposure due to uncertainty with regard to future cash flows. Although interest rate swaps offer some protection against the risks of interest-gapping positions, there are many risk management strategies facing petroleum companies and the answer about which one(s) to choose is not straightforward.

Although this paper has discussed some of the strategies used by the industry, oil and gas companies must frequently audit risk exposures in order to reassess their situation, to identify changing needs in the efficacy of risk management programs, and to optimize the total exposure of the institution in accordance with

the prevailing corporate policy. Because of the increasing customization and complexity of swaps, many industry giants recommend that the right mix of strategies for firms requires having a banking partner that researches petroleum client needs and tailors the strategy to the industry (Peltz, 1994). The juggling act for risk management is to choose a strategy which:

- changes the probability distribution of profits to maximize the probable/possible ratio;
- has the lowest commission costs;
- has the least amount of accounting upkeep, i.e., fixed maturity dates;
- maximizes the skew (or the best trade-off between maximum downside protection and minimum lost upside opportunity); and
- will work under extreme conditions, i.e., large moves in interest rates [Howe, 1992].

The rapid expansion and development of interest rate swap usage in the petroleum industry has paved the way for many new opportunities in financial risk management. Authors, such as Kaufman (1994), caution that as high profitability pulls in greater number of market participants in the petroleum industry, there will eventually be a depressing of substantial profits to be earned in the simpler types of derivatives, such as short-term interest rate swaps. Instead, to be successful oil firms will be looking at the creation of more complex variants or writing the contracts over longer time horizons, thereby increasing the risks. The wide range of instruments will no doubt expand further over the coming years and an understanding of the risks, strategies, and trends taking place provides increased opportunities for astute accountants, financial managers, directors, and senior managers associated with these firms.

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