Forthcoming Journal of Applied Finance, Financial Management Association

The Exxon-Mobil Merger: An Archetype

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February 26, 2002

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ABSTRACT:

In response to change pressures, the oil industry has engaged in multiple adjustment processes. The 9 major oil mergers from 1998 to 2001 sought to improve efficiency so that at oil prices as low as $11 to $12 per barrel, investments could earn their cost of capital. The Exxon-Mobil combination is analyzed to provide a general methodology for merger evaluation. The analysis includes: the industry characteristics, the reasons for the merger, the nature of the deal terms, discounted cash flow (DCF) spreadsheet valuation models, DCF formula valuation models, valuation sensitivity analysis, the value consequences of the merger, antitrust and competitive reaction patterns, and the implications of the clinical study for merger theory.

JEL classification: G34, G20
Keywords: Mergers; Acquisitions; Alliances

The Exxon-Mobil Merger: An Archetype

The high level of merger activities throughout the world between 1994 and 2000 reflected major change forces. These shocks included technological changes, globalization of markets, intensification of the forms and sources of competition leading to deregulation in major industries, and the changing dynamics of financial markets. Mergers and restructuring in the oil industry reflected these broader forces as well as its own characteristics.

The oil industry is large in size and in challenges. In recent decades, most new major reserves have been discovered outside the United States. Potentials for future reserve additions are in countries with considerable business and political risks. The prices of crude oil and oil products have historically been subject to wide fluctuations. The relative advantages of operations integrated over exploration, production, refining, and marketing have changed. Intermediate markets have developed along the value chain. Spot, forward and futures markets have increased in activity. The reduced costs of information have lowered transaction costs. Barriers to entry have fallen and new specialist firms have emerged in most segments of the value chain (Davies, 2000). The ownership of oil and oil reserves has long been a powerful force in the economic, political, and military relationships among nations (Jacoby, 1974; Yergin, 1993).

Repeated oil price shocks have caused the oil industry to engage in a wide range of adjustment responses. Substantial merger activity took place between 1980 and 1985. Diversification efforts into unrelated activities were unsuccessful. Restructuring efforts sought to lower operating costs.

Major horizontal mergers took place during the 1998-2001 period. The BP-Amoco merger (announced on 8/11/98) projected $2 billion in savings, stimulating other oil companies to seek improvements in operations. The Exxon-Mobil combination was announced on 12/1/98. In December 1998, the French oil firm Total (founded in 1924 as Compagnie Française des Pétroles) announced the acquisition of PetroFina, a large Belgian oil company. On 7/5/99, the new TotalFina began a $43 billion hostile bid for the former state-owned Elf Aquitaine; the deal was completed at a price of $48.8 billion and became the fourth largest world oil company. On 4/1/99, an agreement was reached for BP Amoco to acquire Arco following negotiations initiated by Arco's management. The U.S. Federal Trade Commission (FTC) required that Arco sell its Cushing, Oklahoma operations and its Alaskan crude-oil assets (Phillips Petroleum became the buyer). After rejecting a merger proposal from Chevron in June 1999, Texaco agreed to a takeover announced 10/16/00. In October 1998, DuPont did an equity carve-out of 30% of Conoco; the remaining 70% was spun-off to shareholders in August 1999. On 5/29/01, Conoco purchased Gulf Canada Resources. Phillips Petroleum acquired Tosco, the largest U.S. independent refiner, on 2/4/01. On 11/18/01, Phillips and Conoco agreed on a "merger of equals"; ConocoPhillips would become the world's sixth-largest oil and gas company based on reserves.

The motives and consequences of these mergers were similar. In this paper, the Exxon-Mobil transaction is analyzed as representative of these major oil merger transactions. As a clinical study, this paper seeks to provide a format for analyzing mergers under eight major topics: (I) industry characteristics, (II) merger motivations, (III) deal terms and event returns, (IV) valuation analysis, (V) sensitivity analysis, (VI)

tests of merger performance, (VII) antitrust considerations, and (VIII) tests of merger theory.

I. Industry Characteristics

The oil industry, like other industries, has been forced to adjust to the massive change forces of technology, globalization, industry transformations, and entrepreneurial innovations. The oil industry has some special characteristics as well. Oil is a global market with 53% of volume internationally traded. It accounts for about 10% of world trade, more than any other commodity. While the oil market is world in scope, oil varies in quality and the requirements for pipelines and other specialized distribution and marketing facilities cause geographic market segmentation.

A. The Impact of OPEC

The Organization of Petroleum Exporting Countries (OPEC) has a major influence. Because their production costs are low, OPEC has a substantial influence on oil prices. But the pricing power of OPEC has been constrained. In the early 1970s, OPEC's share of the world market was about 55%. The Arab oil embargo in 1973 was associated with more than a three-fold increase in the real price of oil. In response, factories altered production processes away from the use of oil. Consumers increased insulation in their homes, bought smaller cars, and took other energy conservation measures.

At higher prices, exploration for oil was stimulated. Wells that had previously been shut down, again became profitable resulting in increased non-OPEC production.

By 1985, the market share of OPEC had dropped to below 30%. This experience demonstrated that the pricing power of OPEC was limited. In their periodic meetings OPEC has sought to balance production quotas against forecasts of demand and of non-OPEC supply changes with the aim of holding OPEC's market share to a relatively stable 40%. But recurrent cheating on production quotas has occurred as predicted by economic models of cartel behavior. In addition, economic development requirements in OPEC countries create internal pressures for production increases.

B. Oil Price Instability

The interactions of cartel policies and market forces have produced oil price instabilities. In Table 1, crude oil prices for the years 1949 through 2000 are presented in both nominal and real terms. In real terms yearly oil prices declined from $14.71 in 1949 to $10.66 in 1972. The two oil price shocks of the 1970s raised oil prices to almost $51 (real) a barrel by 1981, almost a five-fold increase.

Table 1

Saudi Arabia had been the buffer country to absorb the cheating of other members to keep overall OPEC quotas on target. On 11/20/85, the price of West Texas intermediate crude was $31.75 per barrel (nominal). On 12/9/85, Saudi Arabia announced that it would stop performing the buffer role and would seek to recover some of its lost market share. By early 1986, oil prices had dropped to $10 per barrel (nominal), a decline of 68.5%.

C. Early Restructuring Activities in the U.S. Oil Industry

In the 1980s, the marginal returns from U.S. oil industry domestic exploration and development (E&D) activities were negative. In this setting, Jensen (1986) formulated his free cash flow theory, arguing that internally generated funds resulted in ill-advised diversification. Oil industry examples included acquisitions in mining such as Cyprus Mines by Amoco, Anaconda Copper by Arco, and Kennecott Copper by Sohio. Exxon produced an electric motor and sought to develop it further by acquiring Reliance Electric. The expertise in information systems analysis developed in exploration activities by Exxon was extended to the office systems and equipment businesses. The purchase by Mobil of Marcor included forest products, container business, and the Montgomery Ward retailing operations.

Horizontal oil industry mergers also took place. The largest oil mergers in the eighties are summarized in Table 2. The transactions totaled over $60 billion. The driving force in these mergers was illustrated by the Harvard Business School (HBS) case (Rock, 1988; Ruback, 1992) on the Gulf Oil takeover. The case presented data showing that a firm buying Gulf could avoid a destruction of shareholder value of $50.36 per share by shutting down Gulf's exploration and development (E&D) programs. Adding these savings to the premerger $39 market price of Gulf gives a value of $89.36 per share, justifying the $80 per share paid by Chevron to win the auction contest conducted by Gulf.

Table 2

T. Boone Pickens used this logic in making the initial bid in a number of takeovers listed in Table 2. His strategy was to take a toehold position and threaten a tender offer (Shleifer and Vishny, 1986). If the target found other bidders, Pickens sold

out at a profit. For example, through his Mesa Petroleum, in May 1982 he purchased a 5.1% stake in the Cities Service Oil Company at prices estimated to be around $35.50 per share (Ruback, 1983). A multiple bidder contest ensued including Gulf, Mobil, Amerada Hess, and Occidental Petroleum. On 6/17/82 Gulf agreed to purchase Cities Service, but on 8/2/82 the FTC obtained a restraining order. On 8/9/82 Gulf terminated its offer. On 8/23/82 Mobil decided not to bid. Finally, on 8/25/82 Cities accepted an Occidental bid of $55 a share for 45% of Cities Service shares and an exchange of zero coupon notes and preferred stock for the remainder.

Some takeover contests resulted in the sale of oil companies to firms outside the industry. Seagram (liquor) initially bid for Conoco on 6/19/81 (Ruback, 1982). The subsequent bidding contest included Mobil and DuPont. On 8/5/81, DuPont announced that it had received tenders for 55% of Conoco stock, ending the contest. (In 1999 DuPont did an equity carve-out and spin-off of Conoco). Mobil also entered the bidding when Marathon Oil had reached a tentative agreement with U.S. Steel in 1981 including a lockup option to buy its prized asset, the Yates Oil Field. Although this lockup option was invalidated by the courts, Mobil's bid encountered antitrust obstacles. U.S. Steel won the bidding contest for Marathon Oil.

The above examples are sufficient to suggest that no oil company of any significant size was immune to a takeover threat during the early 1980s. Their stock prices were depressed. It was cheaper to buy oil reserves on Wall Street than by E&D outlays. These pressures caused the major oil companies to engage in a wide range of restructuring activities. Programs for cost reduction were developed. Changes in organizational structure and systems sought to increase efficiency, flexibility, and

responsiveness to change. Reductions in capacity and employment took place. Between 1980 and 1992, employment at eight major oil companies was reduced from 800,000 to 300,000, a reduction of 62.5% (Cibin and Grant, 1996). Headquarters' staff was reduced from 3,000 to 800 in six major oil companies during the period from 1988-1992. Because of fluctuating oil prices, efforts were made to change cost structures from fixed to variable costs. These efforts included replacing owned assets, such as tankers, with leasing (Cibin and Grant, 1996).

Fundamental changes in organization structures were also made. Initially a "unitary" or functional organization structure was employed representing a relatively high degree of centralization of managerial authority. With diversification, the "H form" of structure was employed. This involved a holding company with unrelated subsidiary activities. After substantial divestitures, most companies moved toward the "M form" with multidivisional activities. This form was characterized by a strong central staff, decentralized divisional operations, active communication between divisions, staff support from headquarters, and functional staff groups for related groups of activities (Ollinger, 1994; Roeber, 1994).

The M&A activity of the oil industry can be viewed as a response to price instability. Oil firms sought to invest in new technologies to reduce costs. Previous restructuring efforts and improvements in technologies had lowered costs to $16 to $18 per barrel. Oil prices declined to $9 per barrel in late 1998. Thus, the overriding objective for the mergers beginning in 1998 was to further increase efficiencies to lower breakeven levels toward the $11 to $12 per barrel range.

II. Merger Motivations

The motivations for the Exxon-Mobil merger, completed on 11/30/99, reflect the industry forces described above. By combining complementary assets, Exxon-Mobil would have a stronger presence in the regions of the world with the highest potential for future oil and gas discoveries. The combined company would also be in a stronger position to invest in programs involving large outlays with high prospective risks and returns.

Exxon's experience in deepwater exploration in West Africa would combine with Mobil's production and exploration acreage in Nigeria and Equatorial Guinea. In the Caspian region, Exxon's strong presence in Azerbaijan would combine with Mobil's similar position in Kazakhstan, including its significant interest in the Tengiz field, and its presence in Turkmenistan. Complementary exploration and production operations also existed in South America, Russia, and Eastern Canada.

Near term operating synergies of $2.8 billion were predicted. Two-thirds of the benefits would come from eliminating duplicate facilities and excess capacity. It was expected that the combined general and administrative costs would also be reduced. Additional synergy benefits would come from applying each company's best business practices across their worldwide operations. In a news release on 8/1/00, ExxonMobil reported that synergies had reached $4.6 billion. Analyst reports projected synergies would reach $7 billion by 2002 (Deutsche Bank, "ExxonMobil: The Emperor's New Groove," September 2001).

III. Deal Terms and Event Returns

The basic characteristics of the deal are set forth in Table 3. Exxon had a market value, premerger, of $175 billion, compared with $58.7 billion for Mobil. Exxon had a P/E ratio of about 23.6 versus 17.9 for Mobil. Exxon paid 1.32 shares for each share of Mobil. Since Mobil had 780 million shares outstanding, Exxon paid 1,030 million shares times the $72 share price of Exxon for a total of $74.2 billion. This was a 26.4% premium over the $58.7 billion Mobil market cap.

Table 3

Table 4 shows that premerger, the equity value of Exxon shares represented 75% of the combined market value. The premium paid to Mobil caused the postmerger proportion of ownership to drop to about 70% for Exxon and rise to 30% for Mobil. This demonstrates the fallacy of the statement sometimes made: "In a stock for stock transaction, the terms of the deal don't matter because you are only exchanging paper." The terms of the deal determine the respective ownership shares in the combined company.

Table 4

An event analysis of the announcement of the Exxon-Mobil combination is shown in Table 5. Adjusted by the Dow Jones Major World Oil Companies Index (DJWDOIL), the cumulative return for the 11 trading days prior and through the announcement date of 12/1/98 was 14.8% for Mobil (MOB), and -0.5% for Exxon (XON). By the tenth trading day after the merger announcement, the cumulative adjusted returns for Mobil were 20.6% and for Exxon 3.1%. These event returns reflected the market view that the merger made economic sense.

Table 5

IV. Valuation Analysis

Valuation in practice employs two main types of methodologies. One is the use of comparable valuations. The other is some form of the discounted value of future cash flows.

A. Comparable Valuations

Comparisons may be made with comparable firms or with comparable transactions. Both employ ratios such as (1) enterprise market value/revenues, (2) enterprise market value/EBITDA, or (3) enterprise market value/free cash flows. The comparables method has wide appeal and broad use. It seeks to measure what has occurred in similar situations in the market place. However in application, it is often difficult to find truly comparable companies or transactions.

In the Exxon-Mobil merger, J.P. Morgan, financial advisor to Exxon, reviewed 38 large capitalization stock-for-stock transactions. Their data indicated that a premium of 15% to 25% for Mobil "matched market precedent" (Joint Proxy to Shareholders, 4/5/99). Goldman Sachs for Mobil used 6 large oil companies judged to be similar to Mobil. The two ratios used were price/earnings and price/cash flows. For 1999, the estimated price/earnings ratio range was 19.3 to 23.8 times. The estimated price/cash flows ratios were 8.5 to 12.5. Both the premium analysis by J.P. Morgan and the ratio ranges of Goldman Sachs result in a relatively wide spread of values.

The comparables method in practice fails to arrive at definitive values. This result flows from important conceptual reasons. The companies used in the comparisons are likely to have different track records and opportunities even though they are in similar

businesses and comparable in size. They are likely to differ in their prospective (1) growth rates in revenues, (2) growth rates in cash flows, (3) riskiness (beta) of companies, (4) stages in the life cycles of industry and company, (5) competitive pressures, or (6) opportunities for moving into new expansion areas (Weston, Siu and Johnson, 2001).

B. Discounted Cash Flows (DCF) Valuation

DCF valuation is basically the capital budgeting net present value (NPV) calculation. The gross returns from an investment (GPV) are netted against investment outlays to obtain free cash flows which are discounted at an appropriate rate to obtain NPV or value. The leading valuation methods differ somewhat with respect to the measurement of returns, investments, and discount factors. The choice of discount factor involves the use of a weighted average cost of capital (WACC) versus an adjusted present value approach (APV). The percentage of sales method measures cash flows with reference to sales, discounting free cash flows by WACC. This method is widely used by consulting firms. The methodology is developed in the successive editions of Copeland et al (2000) and Cornell (1993).

Miller and Modigliani (1961, 1963) developed two approaches. The first used the WACC, but keyed on an incremental return on investments and on an investment rate normalized by net operating profit after taxes. The second capitalized future after-tax cash flows by the cost of capital of an unlevered firm to which were added adjustments for tax savings and other benefits. Hence it was called the adjusted present value method (APV). Miller and Modigliani discounted the adjustments with the after-tax cost of debt.

In their empirical analysis of valuations, Kaplan and Ruback (1995) discounted the adjustments with the cost of capital for unlevered firms, calling it the Compressed Adjusted Present Value Model (CAPV). Most finance textbooks use a dividend valuation model under alternative assumptions about the patterns of future dividends. These dividend valuation models require modifications for share repurchases (Lamdin, 2000; Randall, 2000).

Kaplan and Ruback (KR) (1995) used CAPV to predict the actual transaction values for a sample of 51 highly leveraged transactions. They found that 60% of the forecasts were within 15% of the actual transaction value with an average overall error of about 20%. Gilson, Hotchkiss, and Ruback (2000) applied the CAPV model and the comparable companies methodology to a sample of 63 firms emerging from Chapter 11 reorganization. The error terms were larger than in the earlier KR study, with the DCF valuations more accurate than the comparables method.

After reviewing these and other studies, Martin and Petty (2000) conclude that all have large prediction errors, but their use in practice helps firms improve performance. Economic fluctuations and competitive activities cause valuation estimates to be subject to error. However, identification of the key determinants of value (value drivers) can be useful in guiding the firm to timely revisions of policy and practices. We use the WACC and APV percentage of sales methods in the valuation of ExxonMobil. We start with estimates of the costs of capital needed for discounting the cash flows.

C. Cost of Capital Calculations

To obtain the discount factors needed for the DCF valuations, estimates of the cost of equity, of debt and their weighted costs are needed. The Capital Asset Pricing Model (CAPM) is most widely used to calculate the cost of equity. As a check, the cost of equity should be higher than the before-tax cost of debt by 3 to 5 percentage points. The equation for the CAPM is:

$$k_e = r_f + \text{ERP (beta)}$$

where:

k_e = firm's cost of equity
r_f = risk free rate – measured by the expected yields on 10-year Treasury bonds
ERP = equity risk premium – measured by the market return less the risk free rate
beta = the firm's systematic risk – the covariance of firm's returns with the market returns divided by the market variance

The betas are first discussed. Published sources such as Value Line estimated a beta of 0.85 for Exxon and 0.75 for Mobil. Beta estimates are subject to estimation error. However, there is logic for beta levels below 1 for oil companies. The covariances of oil company stock returns with market returns are reduced by the oil industry special economic characteristics described above.

We use a 5.6% yield on 10-year Treasuries as an estimate of the risk-free rate. We next consider the market equity risk premium (ERP). For many years, based on patterns of the long-term relationships between stock and bond returns, the market equity premium appeared to be in the range of 6.5% to 7.5%. By the mid 1990s, a new paradigm for a new economy began to emerge. Academics and practitioners had moved toward using 4% to 5% as the market price of risk (Welch, 2000). But with the stock

market adjustments beginning in 2000, the historical range of 6.5 to 7.5% is again reflected in market valuations.

Using CAPM, with a risk-free rate of 5.6% and a market equity risk premium of 7%, Exxon with a beta of 0.85 would have an estimated cost of equity capital of 11.55%. Mobil with a beta of 0.75 would have a cost of equity capital of 10.85%.

Cost of equity: $k_e = r_f + ERP(beta)$

Exxon: $k_e = 5.6\% + 7\%(0.85) = 11.55\%$

Mobil: $k_e = 5.6\% + 7\%(0.75) = 10.85\%$

For the before-tax cost of debt (k_b), we follow the methodology used in the Paramount case by Kaplan (1995) and in Stewart (1991). Bond ratings and yield data have the virtue of being market-based. Exxon had a AAA bond rating, with yields to maturity at about 160 basis points above Treasuries, for an expected before-tax cost of debt for Exxon of about 7.2%. Mobil had a AA bond rating, requiring an additional 30 basis points over the Exxon debt cost, for an expected before-tax cost of debt for Mobil of 7.5%. These pretax cost of debt estimates indicate a risk differential of about three to four percentage points between equity and debt costs, providing further support for our cost of equity estimates.

Theory calls for using market values in assigning weights to the cost of equity and the cost of debt to obtain a firm's weighted cost of capital. We have studied the leverage policies of the oil companies since 1980. Exxon has had debt-to-total capital (debt plus book equity) ratios as high as 30% to 40%, moving toward 20% in recent years. However, during major acquisition or other major investment programs, these debt-to-capital ratios have been at the higher 40% level. At market values, these ratios would be

lower. A similar analysis would apply for Mobil. Plausible target proportions are B/V_L equals 30% and S/V_L equals 70% where B and S are the market values of debt and equity, respectively, and V_L equals the market value of the firm (B+S). We follow the literature and general practice in using target debt-equity proportions for decisions at the margin (Kaplan, 1995; Stewart, 1991; Copeland et al, 2000). This also has the advantage of solving the circularity problem of obtaining leveraged firm valuations (Copeland et al, 2000, p. 204) which depend on the tax benefit of debt.

The prospective cash tax rates (T) are 35% for Exxon and 40% for Mobil. Accordingly, the weighted average cost of capital (WACC) for the two companies would be:

$$WACC = (S/V_L)\, k_s + (D/V_L)\, k_b\, (1-T)$$

$$\text{Exxon} = 0.7\ (0.1155) + (0.3)(0.072)(0.65) = 9.49\%$$

$$\text{Mobil} = 0.7\ (0.1085) + (0.3)(0.075)(0.60) = 8.95\%$$

The mix of upstream and downstream activities of the two companies, and the combination of different geographic areas of operations would increase the stability of the combined cash flows. The larger size of the combined companies would enable them to take on larger and riskier investment programs than either could do independently. The critical mass size requirements for research and development efforts in all segments of the oil industry have been increasing, so the combination would be risk-reducing in that dimension as well. Value Line and other sources estimated a beta of 0.80 for the combined firm. Using a risk-free rate of 5.6% and an equity risk premium of 7% gives a cost of equity for ExxonMobil of 11.2%. The combined company has a strengthened AAA rating so Exxon's 7.2% debt cost continues to be applicable. With a projected 38%

tax rate and a capital structure with 70% equity, the base case WACC is 9.18% for ExxonMobil:

$$\text{Combined WACC} = 0.70(0.112) + 0.30(0.072)(0.62) = 9.18\%$$

D. Application of the DCF Percentage of Sales Method to ExxonMobil

Projections were developed for the combined company for the years 2001 and beyond as shown in Table 6. The historical patterns provided a foundation for the projections. But these were modified by a business-economic analysis of the future prospects for the oil industry. We studied contemporaneous analyst reports as well as materials from the Energy Information Administration of the U.S. Department of Energy, the Oil & Gas Journal, and consulting firms such as the Energy Economic Newsletter of the WTRG Economics. In Panel A of Table 6, the cash flow inputs are developed. We start with 1999 as the base net revenues of ExxonMobil and use the actual data for 2000. We then project growth rate percentages for net revenues for the years 2001 through 2010 and for the terminal period from 2011 forward.

Table 6

The percentage relationships to revenues are developed in Panel B of Table 6. The product of revenues times the net operating margin gives net operating income (NOI). The NOI margin for the combined company increases as synergies are realized; however, this ratio is also dependent on the price of oil. Oil prices fluctuating around $20 per barrel (real) would balance OPEC production targets and non compliance by some producers with the objective of OPEC to maintain a 40% world market share of oil and oil equivalent revenues. Projections of revenue growth reflect the economics of the

industry. But oil price volatility makes revenue and operating income estimates in individual years provisional.

Continuing in Panel A, the cash tax rates are applied to the NOI to calculate cash income taxes paid which are deducted to obtain net operating profit after taxes (NOPAT). Depreciation is added back since it is a noncash expense. Capital expenditures and changes in working capital are deducted. The disposal of duplicate facilities represents negative outlays shown in the "changes in other assets net" Line 10 in Panel A. The result is the projected "free cash flows" for ExxonMobil shown in Table 6, Panel A, Line 11.

The patterns of free cash flows projected in Table 6 reflect the economic environment of the oil industry as well as the integration of the two companies. The discount factors calculated in the previous section are applied to the free cash flows in Table 6 to obtain the present values of the free cash flows for 2000-2001 shown in Line 14 of Panel A. These items sum to a total present value of $130,331 million shown in the middle section of Panel C, Line (1).

The exit value or terminal value is calculated next. The formula for calculating terminal value with constant growth is the free cash flow in the (n+1) period discounted at the difference between the terminal period WACC and the growth estimate for the terminal period. (In the special case where the terminal period growth is zero, the numerator becomes the n+1 period NOPAT and the denominator becomes the terminal period WACC). The projected continuing growth rate of the free cash flows of 2011 and beyond for ExxonMobil is 3% per year. The estimated terminal value in 2010 is:

$$\text{Terminal Value}_n = \frac{FCF_{n+1}}{WACC - g} = \frac{\$27{,}892}{0.0918 - 0.03} = \$451{,}327 \text{ million}$$

The present value of the terminal value is obtained by discounting the terminal value back to the present using WACC.

$$\frac{\$451{,}327}{(1.0918)^{11}} = \$451{,}327 \times 0.38056 = \$171{,}757 \text{ million}$$

This result is shown in Panel C, Line (2). The sum of (1) the discounted cash flows of the high growth period plus (2) the discounted cash flows of the terminal period plus (3) the initial marketable securities balance gives (4) the total value of the firm of $302,161 million.

From total firm value we deduct total interest-bearing debt to obtain the indicated market value of equity. We divide by the total number of shares outstanding to obtain the intrinsic value per share of $81.45 or $40.725 after the 2-for-1 split of 7/19/01. The resulting indicated share price reflects the projections of the key value drivers. Such provisional results are used in a continuing process of reassessing economic and competitive impacts related to the firm's operating performance and adjustments.

The results reflect the value driver estimates that determine the firm's projected intrinsic value. The intrinsic value projections are planning benchmarks to be monitored by the firm. They can provide the basis for setting performance targets and performance-based compensation systems. Sensitivity analysis establishes that small changes in these value drivers can have a substantial impact on estimates of firm values.

E. DCF Spreadsheet Valuation Using APV

In Table 7 we apply the APV method. Panel A of Table 7 is identical to Panel A of Table 6 down through Line 11, the free cash flows. Instead of discounting by WACC, we discount the free cash flows by the unlevered cost of equity of ExxonMobil. To

obtain the unlevered cost of equity, CAPM is used with the unlevered beta calculated by applying the following expression:

$$\beta_U = \beta_L / [1 + (D/S)(1–T)]$$

where:

β_U = unlevered beta
β_L = levered beta
D = market value of debt
S = market value of equity
T = cash tax rate

Table 7

For ExxonMobil, the observed levered beta was 0.80. Since the D/V_L ratio is 0.30, the D/S ratio is 0.429. The unlevered beta becomes:

$$\beta_U = 0.80 / [1 + (0.429)(1–0.38)] = 0.632$$

and the unlevered cost of equity is:

$$k_U = r_f + ERP(\beta_U) = 5.6\% + 7\% (0.632) = 10.02\%$$

The cost of equity unlevered of 10.02% is used in Line 12 of Table 7. This is the discount factor employed to calculate the present values of the free cash flows shown in Line 14. When these yearly present values are summed, they equal the present value of the cash flows over the period 2000-2010 shown in Panel C Line (2) as $124,465 million.

The calculation of the terminal value proceeds as before. However, the calculation of the discount factor uses the cost of equity of an unlevered firm instead of WACC.

$$\text{Terminal value} = \frac{\$27,892}{0.1002 - 0.03} = \frac{\$27,892}{0.0702} = \$397,322 \text{ million}$$

$$\text{Present value of terminal value} = \frac{\$397,322}{(1.1002)^{11}} = \$397,322 \times 0.34979 = \$138,979 \text{ million}$$

The present value of the terminal value becomes $138,979 million. The total value of ExxonMobil as an unlevered firm is $263,444 million as shown in Table 7, Panel C, Line (4).

We next need to calculate the present value of the tax shield (TS). This is developed in Table 8. This follows the logic in the Modigliani-Miller (1963) tax correction article. We derive the present value of the tax shield as a function of the value of ExxonMobil as an unlevered firm (which we calculated in Table 7 to be $263,444 million), the target leverage ratio, and the actual cash tax rate. The present value of the tax shield is shown to be $33,897 million. In Table 7, we add this amount to the value of the unlevered firm to obtain its value as a levered firm of $297,341 as shown in Panel C, Line (6) . The remaining calculations follow the procedures of Table 6 to obtain approximately the same intrinsic value of $80.08 per share ($40.04 after the split).

Table 8

F. DCF Formula Valuation

The formula approach to DCF valuation summarizes the value driver inputs in a compact framework which relates the input variables to broader economic forces. For example, suppose we have a forecast of the growth of the U.S. economy of 5.0% for the next ten years, with 2.5% real and 2.5% inflation. In this overall economic environment, we postulate that revenues in the oil industry grow at 3% a year. We project ExxonMobil to grow at a somewhat higher rate per year for the next ten years. This implies some growth in the firm's market share. Some increased competitive pressures will develop. This may influence not only ExxonMobil's revenue growth rates, but the magnitudes of other value drivers as well. Individual value drivers may need to be adjusted upward or

downward. This establishes the planning relationships between value drivers, performance results, and the resulting projected intrinsic value levels of the firm. This is at the heart of value based management.

We can build on the spreadsheet approach to make estimates of the patterns of the value drivers for the initial growth period and for the terminal period in a systematic way. This is illustrated in Panel A of Table 9. Using ExxonMobil for illustration, we present projections of nine value drivers for the growth period and eight value drivers for the terminal period (the number of years is not applicable). The formula projections represent trend patterns for the up and down movements that may occur for individual years in the spreadsheet projections.

Table 9

Panel B presents the formulas which are a mathematical summary of the steps in the spreadsheet procedure. The resulting firm values are shown in Panel C. The estimate of intrinsic value per share is about the same as in the spreadsheet calculation. We attach no significance to their equality. The exercise simply illustrates that the spreadsheet valuations and the formula valuations produce similar results.

V. Sensitivity Analysis

Much analysis and many judgments are required in estimating the future behavior of the value drivers. To assess the impact of possible changes in the future behavior of the key value drivers, it is useful to perform sensitivity studies. These can be useful in management planning and control systems and in other forms of enterprise resource planning. The sensitivity analysis can be performed with either the spreadsheet or formula approaches. The formula method is used for simplicity of exposition.

In Table 10, we calculate the elasticities of the responses in the ExxonMobil intrinsic value levels to upward and downward changes in each of the value drivers. The analysis changes one value driver, holding constant the levels of the others. The elasticities calculated and shown in the bottom of Table 10 are based on the maximum percent changes calculated. The elasticities are positive for the growth rate in revenues, the net operating income margin, and the duration of the period of competitive advantage. The elasticities are negative for tax rates, cost of capital, and total investment requirements.

Table 10

The negative elasticity for investment requirements results from the construction of the sales growth DCF spreadsheet model. In this model when the investment requirements ratios change, the growth rate remains unchanged so the profitability ratio changes in the opposite direction. In other models, such as in the Miller and Modigliani (1961) dividend paper, growth is defined as the product of profitability and investment requirements, so investment could have a positive elasticity.

Another dimension of sensitivity is shown in Table 11, in which paired value drivers are analyzed. The top part of the table reflects the critical relationship between the operating margin and the cost of capital. When the spread between the operating margin and the discount rate widens, the impact on valuation is magnified (and conversely). In the lower part of Table 11 the relationship between the growth rates in revenues and in the net operating margin is shown. In some business circumstances a tradeoff between revenue growth and operating margin may be encountered. Hence various combinations of revenue growth and operating margins can be usefully analyzed.

Table 11

The sensitivity analysis shown in Tables 10 and 11 enables the decision maker to identify the relative strength of the value drivers on the valuation of the enterprise. Valuations reflect changes in the economy and competitive developments. Valuation estimates are useful because they sensitize decision makers to how the economic and competitive changes affect critical value drivers. In the strategic planning processes of firms, valuations perform an important role in a firm's information feedback system. In identifying the impact of value drivers on valuation changes, sensitivity analysis is used in planning processes for improving the performance of the firm and in valuation estimates by outside analysts.

VI. Tests of Merger Performance

Table 12 illustrates how to test for increases in shareholder value by analysis of the combined operations. Table 12 begins with the respective premerger values, totaling $233.7 billion. The base equity valuation of the combined companies from Table 9 is $283.3. Deduct the $74.2 billion paid to Mobil. This leaves $209.1 billion. The premerger value of Exxon was $175 billion. Hence the gain from the merger was $34.1 billion. The Mobil $10.2 billion share of the estimated value increase, combined with the $15.5 billion premium, represents a total gain of $25.7 billion to its shareholders. The gain of $23.9 billion to the original Exxon shareholders represents approximately the same as total gains to Mobil shareholders.

Table 12

More generally, Healy, Palepu and Ruback (1992) find that event returns are statistically significant predictors of subsequent market value changes as well as accounting performance measures. For the 9 major oil industry mergers during 1998-

2001, Table 13 summarizes value changes (industry adjusted) over a window from 10 days before the announcement date to 10 days after the announcement date. Targets increased in value by $43.8 billion. Acquirers increased in value by $7.8 billion. The combined value increase was $51.6 billion. The acquisition by Total (French) of PetroFina (Belgian) was the sole transaction for which the value change was negative. Analysts were critical of the 54.8% premium offered by Total, while exposing itself to substantial cyclical risks of the petrochemical industry and to PetroFina's low margins on its retail operations. This example also illustrates how the event returns reflect the market's evaluation of the underlying economics of the deal. Table 13 demonstrates that the 9 major oil merger deals during 1998-2001 overall were value increasing for both targets and acquirers.

Table 13

VII. Antitrust Considerations

For large oil company mergers, antitrust issues must be taken into account. Antitrust agencies place great emphasis on market concentration effects using the Herfindahl-Hirschman Index (HHI or H index) first adopted by the U.S. regulatory authorities in Guidelines issued in 1982. The H index is measured by the sum of the squares of the market shares of all of the firms in the industry. The economic justification for the use of the HHI measure is that it can be shown to be related mathematically to a measure of the price-cost margin measure of monopoly power [(p – c)/p] (where p = price and c = marginal cost) (Landes and Posner, 1981).

The calculation procedure is straightforward. For example, suppose the largest four firms in some industry have market shares of 20%, 15%, 10%, and 5% respectively;

the remaining 100 firms in the industry have a 0.5% market share each. The H index would be: 400 + 225 + 100 + 25 + 100(0.25) which equals 775. If the smallest two of the top four merged, the H index would become: 400 + 225 + 225 + 100(0.25) which equals 875. This illustrates how horizontal mergers result in higher industry concentration measures.

The critical H index specified in the Guidelines is 1,000. Below 1,000, concentration is considered sufficiently low, so that no further investigation is automatically required to determine possible effects on competition. If a post-merger H index is between 1,000 and 1,800 and the index was increased by 100 or more, the merger would be investigated. If the industry H index is more than 1,800 and it was increased by at least 50, the merger is likely to be challenged.

Calculations of the H index for the petroleum industry show a relatively stable pattern around 400 for the period 1975 through 1997 (Davies, 2000; U.S, Department of Commerce, 1996; U.S. Energy Information Administration, 1999). For 1997, the H index was 389. The reason that the H index for the petroleum industry did not increase between 1987 and 1997 was that the smallest firms grew faster than the largest (U.S. Energy Information Administration, 1999, p. 69).

In Table 14, the effects of recent major mergers on the H index measures are shown. With 9 mergers among the largest petroleum companies during 1998-2001, the HHI for the petroleum industry would rise from 389 points to 583 points, an increase of 194 points. The total HHI for the industry of 583 would still be well short of the 1,000 critical level specified in the regulatory Guidelines. The reason for this is that although individual oil companies are large, they are in an industry that is also large, whether

measured by revenues, total assets, or reserves. These are multibillion-dollar companies in a $1,476 billion (1997 revenues) industry. Thus, by the criteria of the U.S. regulatory authorities, the overall industry concentration measures are so far below the H index 1,000 threshold that from an aggregate industry standpoint, antitrust concerns are not raised.

Table 14

While the concentration levels are well below the critical 1,000 level for the global exploration and production markets, the refining and distribution markets are segmented. The regulatory authorities have required some divestments of assets in each of the major mergers listed in Table 14. These ranged from wholesale distribution facilities in the case of ExxonMobil to divestitures by BP Amoco of Arco's Alaskan assets.

Preoccupation with measurement of concentration ratios misses the dynamics of the new competitive patterns emerging in the oil and energy industries. The improved efficiencies of the megafirms (ExxonMobil, BP, Shell, TotalFinaElf) have enabled them to operate close to breakeven on oil prices as low as $11-$12 per barrel. But the megafirms do not have proprietary control of technology or know how. Oil service companies make such knowledge available to any industry participant (Davies, 2000). The integrated firms have long been in the traditional areas of oil and gas exploration and production, refining, and marketing. Less generally recognized is their significant penetration into the chemical industry, particularly petrochemicals. Three oil firms occupy the ranks of 3, 11, and 13 in U.S. chemical industry sales.

Of the top 25 oil firms, 15 are at least partially state-owned. The state-owned national oil companies (NOCs) are major forces with potentials and interests in

expanding their roles. Saudi Arabia began holding discussions in 1998 about developing a gas business. One of the large NOCs, such as Saudi Aramco, could conceivably become a megafirm by purchasing an operating company and broadening its interests. Traditionally, the petroleum industry has been characterized by a varied pattern of relationships among the megafirms, other large integrated firms, specialized firms, oil service firms, and the NOCs. Through alliances and joint ventures, these relationships have been expanded to respond to the new competitive dynamics of the industry.

VIII. Tests of Merger Theory

Three major types of merger motivations were identified by Berkovitch and Narayanan (1993): synergy, hubris, and agency problems. In the Exxon-Mobil merger, synergy and efficiency objectives were promised and achieved. The initial synergies were estimated at $2.8 billion. As a result of rapid and effective integration of the two companies, Chairman Lee Raymond announced within seven months of the completion of the merger that synergies of $4.6 billion had been achieved. Analysts' reports were projecting a further increase in synergies to the $7 billion level.

Synergies can result from cost reductions or revenue increases. ExxonMobil benefited from sales of duplicate facilities and employment reductions. Costs were reduced by adoptions of best practices from both companies, particularly in combining advanced technologies. Revenue increases can come from strengthening the market positions of each. In addition, joint ventures with major producing countries such as Saudi Arabia were facilitated by strengthening Exxon's position as one of the three largest international oil companies.

Hubris may be reflected in overpaying for the target. Exxon paid a premium of $15.5 billion. The equity market cap of the combined firm increased from $234 billion to actual values of $280 billion by the end of 1999 and to $301 billion by the end of 2000. Thus the capitalized value of the synergies was $46 to $67 billion. In his news release of 8/1/00, Chairman Raymond stated that an improvement of at least 3 points above the historic Exxon level of return on capital employed (ROCE) was being achieved. These results are inconsistent with agency problems.

Other motives for mergers discussed in the literature include tax savings, monopoly, and redistribution. Tax aspects were not a major factor. Regulatory agencies found no antitrust problems in the upstream activities (exploration and development). However, divestitures were required in downstream activities (distribution and marketing). Redistribution from bondholders did not occur. Redistribution from labor took place in the sense that employment reshuffling and reductions were made.

In their review of merger activity, Holmstrom and Kaplan (2001) described the positive influence of a number of developments in the 1990s. These included an increase in equity-based compensation, an increased emphasis on shareholder value, a rise of shareholder activism, improved and more active boards of directors, increased CEO turnover, and an increased role of capital markets. The efforts for efficiency improvements sought in the Exxon-Mobil merger reflected these general developments.

In their companion review, Andrade, Mitchell, and Stafford (2001) further developed the earlier Mitchell and Mulherin (1996) emphasis on the role of shocks in causing mergers. Their analysis is applicable to the oil industry mergers. But the pressures have been more than periodic shocks. Price instability has been a continuing

problem for oil firms. Large price changes in both downward and upward directions have been destabilizing. Price drops reduce profit margins and investment returns. Price rises increase margins and returns, but stimulate production expansion and new entrants. Hence, price uncertainty created strong continuing pressures for improved efficiency to reduce oil finding and production costs.

Another oil industry characteristic is high sensitivity to changes in overall economic activity. The East Asian financial problems in 1997-98 reduced demand resulting in a decline in world oil prices to below $10 per barrel in late 1998. The decline in growth in the U.S. economy beginning in 2000 contributed to the drop in oil prices from $37 to under $20 per barrel during 2001.

The rise of 15 government-connected national oil companies created increased competitive pressures. The increased application of technological advances in exploration, production, refining methods, and transportation logistics created new competitive opportunities and threats. Price instabilities (like persistent overcapacity in the steel, auto, and chemical industries) cause continuing pressures for M&A activities to reduce costs and increase revenues. In addition, the $2 billion synergy in the BP acquisition of Amoco stimulated competitive responses resulting in other mergers, alliances, and joint ventures. The oil industry M&A activities during 1998-2001 are consistent with the industry shocks theory, an industry structural problems theory, and a theory of competitive responses.

IX. Reprise

The Exxon-Mobil combination is an archetype of a successful merger. Fundamentally, the reasons, structures, and implementation of the transaction reflected

the characteristics of the oil and gas industry. The industry increasingly utilizes advanced technology in exploration, production, refining, and in the logistics of its operations. It is international in scope. World demand is sensitive to economic conditions. The weakness in the Asian economies pushed prices below $10 per barrel at the end of 1998. The U.S. recession which began in March 2001 helped push oil prices from $32 a barrel to $17 a barrel by November 2001.

Critics of merger activities have argued that the likelihood of successful mergers is small. Prevailing market prices of the equity of firms embody some probability of a takeover. In addition, they argue that purchase prices include substantial premiums requiring increases in values of acquired firms not likely to be achieved. The Exxon-Mobil combination provides counter evidence. Synergies include improvements in the performance of all the parties in the transaction. Premiums are usually expressed as a percentage of the premerger market cap of the target. These percentages can run high. However, more relevant is the amount of the premium in relation to the size of the combined firm. The $15.5 billion premium to Mobil was 26.4% of its market cap, but represented only 6.6% of the combined premerger market cap. The $2.8 billion premerger synergy estimate ($7 billion postmerger) required only a modest valuation multiple to recover the $15.5 billion premium. More generally, Table 13 demonstrates that in total the 9 major oil transactions were value increasing for acquirers as well as targets.

This paper develops a framework for an analysis of how M&As can perform a positive role in aiding firms adjust to changing environments. We emphasize a multiple approach. Critical are: the economics of the industry, the business logic of the

combination within the framework of the industry and the economy, the behavior of the value drivers in the financial analysis of the merger, regulatory factors, and competitive interactions.

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Table 1
Crude Oil Prices at the Wellhead (First Purchase Prices)
U.S. Yearly Average (Dollars per Barrel)

Year	Nominal	GDP Deflator	Real
1949	$2.54	17.265	$14.71
1950	2.51	17.411	14.42
1951	2.53	18.595	13.61
1952	2.53	18.983	13.33
1953	2.68	19.238	13.93
1954	2.78	19.448	14.29
1955	2.77	19.735	14.04
1956	2.79	20.413	13.67
1957	3.09	21.127	14.63
1958	3.01	21.642	13.91
1959	2.90	21.878	13.26
1960	2.88	22.186	12.98
1961	2.89	22.433	12.88
1962	2.90	22.739	12.75
1963	2.89	22.992	12.57
1964	2.88	23.336	12.34
1965	2.86	23.773	12.03
1966	2.88	24.450	11.78
1967	2.92	25.207	11.58
1968	2.94	26.290	11.18
1969	3.09	27.586	11.20
1970	3.18	29.051	10.95
1971	3.39	30.516	11.11
1972	3.39	31.812	10.66
1973	3.89	33.596	11.58
1974	6.87	36.603	18.77
1975	7.67	40.027	19.16
1976	8.19	42.293	19.36
1977	8.57	45.015	19.04
1978	9.00	48.224	18.66
1979	12.64	52.242	24.20
1980	21.59	57.053	37.84
1981	31.77	62.367	50.94
1982	28.52	66.256	43.05
1983	26.19	68.873	38.03
1984	25.88	71.438	36.23
1985	24.09	73.695	32.69
1986	12.51	75.324	16.61
1987	15.40	77.575	19.85
1988	12.58	80.215	15.68
1989	15.86	83.271	19.05
1990	20.03	86.527	23.15
1991	16.54	89.661	18.45
1992	15.99	91.846	17.41
1993	14.25	94.053	15.15
1994	13.19	96.006	13.74
1995	14.62	98.103	14.90
1996	18.46	100.000	18.46
1997	17.23	101.947	16.90
1998	10.87	103.225	10.53
1999	15.56	104.772	14.85
2000	26.73	106.985	24.98

Source: Energy Information Administration, and Bureau of Economic Analysis

Table 2
Largest Oil Acquisitions in the 1980s

Year	Acquirer	Acquired	Purchase Price (millions)
1984	Chevron Corp.	Gulf Corp.	$13, 205.5
1981	E.I. DuPont de Nemours & Co.	Conoco Inc.	8, 039.8
1981	U.S. Steel Corp.	Marathon Oil Corp.	6,618.5
1984	Mobil Corp.	Superior Oil Co.	5,725.8
1981	Societe Nationale Elf Aquitaine-France	Texasgulf Inc.	4,293.7
1987	Amoco Corp.	Dome Petroleum Ltd.-Canada	4,180.0
1989	Exxon Corp.	Texaco Canada Inc.-Canada	4,149.6
1982	Occidental Petroleum Corp.	Cities Service Co.	4,115.6
1985	U.S. Steel Corp.	Texas Oil & Gas Corp.	4,094.4
1979	Shell Oil Co.	Belridge Oil Co.	3,653.0
1985	Occidental Petroleum Corp.	MidCon Corp.	3,085.6
Total			$61,161.5

Table 3
Exxon / Mobil Financial Relations

	Exxon		Mobil
Market Value (billion)[1]	$175.0		$58.7
Book Value (billion)[2]	$43.7		$19.0
Market Value / Book Value	4.0		3.1
LTM Net Income (million)[3]	$7,410		$3,272
PE Ratio	23.6		17.9
Total Paid (billion)		$74.2	
Premium Over Market			
Amount (billion)		$15.5	
Percent		26.4%	
Premium Over Book			
Amount (billion)		$55.2	
Percent		290.5%	

(1) Market Value as of 11/20/98.

(2) Book Value as of 9/30/98; source 1998 3Q 10Q.

(3) LTM Net Income is through 9/30/98. LTM is Last 12 Months.

Table 4
Exxon / Mobil Deal Terms

Pre-Merger	Dollar Amounts			Percentage	
	Exxon	Mobil	Total	Exxon	Mobil
Share Price[1]	$72.00	$75.25			
Shares Outstanding (million)[2]	2,431	780			
Total Market Value (billion)	$175.0	$58.7	$233.7	74.9%	25.1%
Exchange Terms	1.32 for	1			
Post-Merger					
Number of Shares (million)	2,431	1,030	3,461	70.2%	29.8%

(1) Share Prices as or 11/20/98, a few days before runup in stock prices; announced 12/01/98

(2) Shares Outstanding are as of 1998 3Q 10Qs

Table 5
Exxon (XON) and Mobil (MOB) Initial Market Responses

Date	Dow Jones DJWDOIL Index	Returns on DJWDOIL Index	Cumulative Actual Returns	MOB	MOB Returns	Cumulative Actual Returns	Cumulative Adjusted Returns	XON	XON Returns	Cumulative Actual Returns	Cumulative Adjusted Returns
11/13/1998	216.62			73.44				72.88			
11/16/1998	215.41	-0.558%	-0.558%	72.63	-1.107%	-1.107%	-0.549%	71.44	-1.972%	-1.972%	-1.414%
11/17/1998	213.39	-0.938%	-1.496%	71.94	-0.946%	-2.053%	-0.557%	70.56	-1.225%	-3.197%	-1.701%
11/18/1998	213.86	0.219%	-1.277%	73.63	2.345%	0.292%	1.569%	70.69	0.177%	-3.020%	-1.743%
11/19/1998	212.18	-0.787%	-2.064%	73.50	-0.170%	0.122%	2.186%	69.88	-1.150%	-4.170%	-2.106%
11/20/1998	215.82	1.717%	-0.347%	75.25	2.381%	2.503%	2.850%	72.00	3.041%	-1.129%	-0.782%
11/23/1998	216.45	0.291%	-0.056%	76.19	1.247%	3.750%	3.805%	72.06	0.086%	-1.042%	-0.987%
11/24/1998	215.29	-0.535%	-0.590%	74.94	-1.641%	2.109%	2.699%	72.69	0.869%	-0.174%	0.416%
11/25/1998	215.13	-0.076%	-0.666%	78.38	4.586%	6.696%	7.361%	72.69	0.000%	-0.174%	0.492%
11/27/1998	223.59	3.935%	3.270%	86.00	9.729%	16.424%	13.155%	74.38	2.321%	2.147%	-1.122%
11/30/1998	220.66	-1.313%	1.956%	86.00	0.000%	16.424%	14.468%	75.00	0.840%	2.987%	1.031%
12/1/1998	214.08	-2.980%	-1.023%	83.75	-2.616%	13.808%	14.831%	71.63	-4.500%	-1.513%	-0.489%
12/2/1998	210.29	-1.772%	-2.796%	84.19	0.523%	14.331%	17.127%	71.25	-0.524%	-2.036%	0.759%
12/3/1998	208.45	-0.873%	-3.669%	84.50	0.371%	14.702%	18.370%	70.56	-0.966%	-3.002%	0.667%
12/4/1998	209.71	0.602%	-3.067%	86.00	1.775%	16.477%	19.543%	71.50	1.329%	-1.672%	1.394%
12/7/1998	211.28	0.749%	-2.318%	87.38	1.599%	18.076%	20.394%	73.00	2.098%	0.426%	2.743%
12/8/1998	213.80	1.195%	-1.123%	87.94	0.644%	18.720%	19.843%	73.19	0.258%	0.683%	1.806%
12/9/1998	216.66	1.338%	0.215%	88.25	0.355%	19.075%	18.860%	73.94	1.025%	1.708%	1.493%
12/10/1998	216.13	-0.245%	-0.030%	88.25	0.000%	19.075%	19.105%	73.75	-0.254%	1.454%	1.484%
12/11/1998	215.18	-0.441%	-0.471%	88.88	0.708%	19.783%	20.254%	74.63	1.186%	2.640%	3.111%
12/14/1998	214.87	-0.143%	-0.614%	89.38	0.563%	20.346%	20.960%	74.44	-0.251%	2.389%	3.004%
12/15/1998	213.36	-0.705%	-1.319%	88.44	-1.048%	19.297%	20.617%	74.00	-0.588%	1.801%	3.120%

Table 6
DCF Spreadsheet Valuation of ExxonMobil (Dollar Amounts in Millions Except per Share)

	2000	2001E	2002E	2003E	2004E	2005E	2006E	2007E	2008E	2009E	2010E	2011E On
Panel A – Inputs for Present Value Calculations												
1. Net revenues*	$206,083	$185,475	$191,039	$198,680	$208,615	$224,261	$238,838	$253,168	$265,826	$276,459	$284,753	$293,296
2. Revenue growth rate	28.1%	-10.0%	3.0%	4.0%	5.0%	7.5%	6.5%	6.0%	5.0%	4.0%	3.0%	3.0%
3. NOI	$ 25,179	$ 22,257	$ 28,656	$ 31,789	$ 34,421	$ 40,367	$ 40,602	$ 43,039	$ 45,190	$ 45,616	$ 46,984	$ 45,461
4. Cash tax rate	39.9%	38.0%	38.0%	38.0%	38.0%	38.0%	38.0%	38.0%	38.0%	38.0%	38.0%	38.0%
5. Income taxes	10,056	8,458	10,889	12,080	13,080	15,339	15,429	16,355	17,172	17,334	17,854	17,275
6. NOPAT	$ 15,123	$ 13,799	$ 17,767	$ 19,709	$ 21,341	$ 25,027	$ 25,173	$ 26,684	$ 28,018	$ 28,282	$ 29,130	$ 28,186
7. + Depreciation	8,130	7,419	7,642	7,947	8,345	8,970	9,554	10,127	10,633	11,058	11,390	11,732
8. – Change in working capital	5,463	2,782	2,866	2,980	3,129	3,364	3,583	3,798	3,987	4,147	4,271	4,399
9. – Capital expenditures	8,446	8,346	7,642	7,947	8,345	10,092	10,748	11,393	11,962	12,441	12,814	7,332
10. – Change in other assets net	583	(2,318)	(2,388)	(2,484)	(2,608)	(2,803)	(2,985)	(3,165)	(3,323)	(3,456)	(3,559)	293
11. Free cash flows	$ 8,761	$ 12,408	$ 17,289	$ 19,212	$ 20,820	$ 23,346	$ 23,382	$ 24,785	$ 26,024	$ 26,208	$ 26,995	$ 27,892
12. WACC	9.18%	9.18%	9.18%	9.18%	9.18%	9.18%	9.18%	9.18%	9.18%	9.18%	9.18%	9.18%
13. Discount factor	0.91592	0.83891	0.76837	0.70376	0.64459	0.59039	0.54075	0.49529	0.45364	0.41550	0.38056	
14. Present values	$ 8,025	$ 10,409	$ 13,284	$ 13,521	$ 13,420	$ 13,783	$ 12,644	$ 12,276	$ 11,806	$ 10,890	$ 10,273	
Panel B – Operating Relationships (As a % of Revenues)												
NOI	12.2%	12.0%	15.0%	16.0%	16.5%	18.0%	17.0%	17.0%	17.0%	16.5%	16.5%	15.5%
NOPAT	7.3%	7.4%	9.3%	9.9%	10.2%	11.2%	10.5%	10.5%	10.5%	10.2%	10.2%	9.6%
Depreciation	3.9%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Change in working capital	2.7%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Capital expenditures	4.1%	4.5%	4.0%	4.0%	4.0%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	2.5%
Change in other assets net	0.3%	-1.25%	-1.25%	-1.25%	-1.25%	-1.25%	-1.25%	-1.25%	-1.25%	-1.25%	-1.25%	0.1%
Free cash flow	4.3%	6.7%	9.1%	9.7%	10.0%	10.4%	9.8%	9.8%	9.8%	9.5%	9.5%	9.5%

Panel C – Valuation Calculations

Risk-free rate	5.60%				
Beta	0.80	(1) PV of cash flows, 2000-2010	$130,331	Total value of the firm	$302,161
Equity risk premium	7.00%	(2) PV of terminal value	$171,757	Value of debt	18,972
Cost of equity	11.20%	(3) Marketable securities	73	Value of equity	$283,189
Cost of debt (before-tax)	7.20%	(4) Total value of the firm	$302,161	Shares outstanding	3,477
Cost of debt (after-tax)	4.46%			Intrinsic share price	$ 81.45
Capital structure, % equity	70.00%				
Base WACC	9.18%				

* Net revenues exclude excise taxes and earnings from equity interests. End-of-year revenues for 1999 were $160,883 million.

Table 7
DCF Spreadsheet Valuation of ExxonMobil Using APV (Dollar Amounts in Millions Except per Share)

	2000	2001E	2002E	2003E	2004E	2005E	2006E	2007E	2008E	2009E	2010E	2011E On
Panel A – Inputs for Present Value Calculations												
1. Net revenues*	$206,083	$185,475	$191,039	$198,680	$208,615	$224,261	$238,838	$253,168	$265,826	$276,459	$284,753	$293,296
2. Revenue growth rate	28.1%	-10.0%	3.0%	4.0%	5.0%	7.5%	6.5%	6.0%	5.0%	4.0%	3.0%	3.0%
3. NOI	$ 25,179	$ 22,257	$ 28,656	$ 31,789	$ 34,421	$ 40,367	$ 40,602	$ 43,039	$ 45,190	$ 45,616	$ 46,984	$ 45,461
4. Cash tax rate	39.9%	38.0%	38.0%	38.0%	38.0%	38.0%	38.0%	38.0%	38.0%	38.0%	38.0%	38.0%
5. Income taxes	10,056	8,458	10,889	12,080	13,080	15,339	15,429	16,355	17,172	17,334	17,854	17,275
6. NOPAT	$ 15,123	$ 13,799	$ 17,767	$ 19,709	$ 21,341	$ 25,027	$ 25,173	$ 26,684	$ 28,018	$ 28,282	$ 29,130	$ 28,186
7. + Depreciation	8,130	7,419	7,642	7,947	8,345	8,970	9,554	10,127	10,633	11,058	11,390	11,732
8. – Change in working capital	5,463	2,782	2,866	2,980	3,129	3,364	3,583	3,798	3,987	4,147	4,271	4,399
9. – Capital expenditures	8,446	8,346	7,642	7,947	8,345	10,092	10,748	11,393	11,962	12,441	12,814	7,332
10. – Change in other assets net	583	(2,318)	(2,388)	(2,484)	(2,608)	(2,803)	(2,985)	(3,165)	(3,323)	(3,456)	(3,559)	293
11. Free cash flows	$ 8,761	$ 12,408	$ 17,289	$ 19,212	$ 20,820	$ 23,346	$ 23,382	$ 24,785	$ 26,024	$ 26,208	$ 26,995	$ 27,892
12. Cost of Equity Unlevered	10.02%	10.02%	10.02%	10.02%	10.02%	10.02%	10.02%	10.02%	10.02%	10.02%	10.02%	10.02%
13. Discount factor	0.90893	0.82615	0.75091	0.68252	0.62036	0.56386	0.51251	0.46583	0.42340	0.38484	0.34979	
14. Present values	$ 7,963	$ 10,251	$ 12,982	$ 13,113	$ 12,916	$ 13,164	$ 11,984	$ 11,546	$ 11,019	$ 10,086	$ 9,443	
Panel B – Operating Relationships (As a % of Revenues)												
NOI	12.2%	12.0%	15.0%	16.0%	16.5%	18.0%	17.0%	17.0%	17.0%	16.5%	16.5%	15.5%
NOPAT	7.3%	7.4%	9.3%	9.9%	10.2%	11.2%	10.5%	10.5%	10.5%	10.2%	10.2%	9.6%
Depreciation	3.9%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Change in working capital	2.7%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Capital expenditures	4.1%	4.5%	4.0%	4.0%	4.0%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	2.5%
Change in other assets net	0.3%	-1.25%	-1.25%	-1.25%	-1.25%	-1.25%	-1.25%	-1.25%	-1.25%	-1.25%	-1.25%	0.1%
Free cash flow	4.3%	6.7%	9.1%	9.7%	10.0%	10.4%	9.8%	9.8%	9.8%	9.5%	9.5%	9.5%

Panel C – Valuation Calculations

Risk-free rate	5.60%	*(1)*	Terminal value	$397,322		
Beta levered	0.80					
Equity risk premium	7.00%	*(2)*	PV of cash flows, 2000-2010	$124,465	Total value of the firm	$297,414
Debt ratio (D/V_L)	30.0%	*(3)*	PV of terminal value	138,979	Value of debt	18,972
Debt-equity ratio (D/S)	42.9%	*(4)*	Value of unlevered firm	$263,444	Value of equity	$278,442
Tax rate	38.0%	*(5)*	PV of tax shield	33,897	Shares outstanding	3,477
Beta unlevered	0.63	*(6)*	Value of levered firm	$297,341	Intrinsic share price	$ 80.08
Cost of equity unlevered	10.02%	*(7)*	Marketable securities	73		
Terminal period growth rate	3.00%	*(8)*	Total value of the firm	$297,414		

* Net revenues exclude excise taxes and earnings from equity interests. End-of-year revenues for 1999 were $160,883 million.

Table 8
Value of the Firm and Tax Shield

Definitions:
V_U = Value of unlevered firm
V_L = Value of levered firm
TS = Present value of tax shield
D = Value of debt
D/V_L = Debt ratio
T = Tax rate
k_d = Cost of debt

$$TS = \text{PV(tax shield)} = \frac{k_d \times D \times T}{k_d} = D \times T \quad \text{(assume perpetuity)}$$

Value of levered firm = Value of unlevered firm + PV(tax shield)

$$V_L = V_U + DT$$

V_L can be restated as:

$$\begin{aligned} V_U &= V_L - DT \\ &= V_L\left(1 - \frac{D}{V_L}T\right) \\ V_L &= \frac{V_U}{1-(D/V_L)T} \end{aligned}$$

The present value of the tax shield can then be expressed as:

$$\begin{aligned} TS &= DT \\ &= V_L \times (D/V_L) \times T \\ &= \frac{V_U}{1-(D/V_L)\,T} \times (D/V_L) \times T \\ &= \frac{\$263{,}444}{1-0.30(0.38)} \times 0.30 \times 0.38 = \$33{,}897 \text{ million} \end{aligned}$$

Table 9
DCF Formula Valuation of ExxonMobil
(Dollar Amounts in Millions Except Per Share)

Panel A – Value Drivers

R_0 =	Base year revenues (EOY 1999)*	$160,883
	Initial growth period	
m_s =	Net operating income margin	16.5%
T_s =	Tax rate	38.0%
g_s =	Growth rate	5.1%
d_s =	Depreciation	4.0%
I_{ws} =	Working capital requirements	1.5%
I_{fs} =	Capital expenditures	4.5%
I_{os} =	Change in other assets net	-1.25%
k_s =	Cost of capital	9.18%
n =	Number of growth years	11
	Terminal period	
m_c =	Net operating income margin	15.5%
T_c =	Tax rate	38.0%
g_c =	Growth rate	3.0%
d_c =	Depreciation	4.0%
I_{wc} =	Working capital requirements	1.5%
I_{fc} =	Capital expenditures	2.5%
I_{oc} =	Change in other assets net	0.1%
k_c =	Cost of capital	9.18%
$1 + h$ =	calculation relationship = $(1+g_s)/(1+k_s)$	0.9626

Panel B – Formula

$$V_0 = R_0[m_s(1-T_s) + d_s - I_{ws} - I_{fs} - I_{os}]\sum_{t=1}^{n}\frac{(1+g_s)^t}{(1+k_s)^t} + \frac{R_0(1+g_s)^n(1+g_c)[m_c(1-T_c) + d_c - I_{wc} - I_{fc} - I_{oc}]}{(k_c - g_c)(1+k_s)^n}$$

$$V_0 = \frac{R_1[m_s(1-T_s) + d_s - I_{ws} - I_{fs} - I_{os}]}{1+k_s}\left(\frac{(1+h)^n - 1}{h}\right) + \frac{R_0(1+g_s)^n(1+g_c)[m_c(1-T_c) + d_c - I_{wc} - I_{fc} - I_{oc}]}{(k_c - g_c)(1+k_s)^n}$$

Panel C – Calculating Firm Value

Present value of initial growth period cash flows	$ 134,466
Present value of terminal value	167,724
Enterprise operating value	$ 302,191
Add: Marketable securities	73
Total value of the firm	$ 302,264
Less: Total interest-bearing debt	18,972
Equity value	$ 283,292
Number of shares	3,477
Value per share	$ 81.48

* Revenues exclude excise taxes and earnings from equity interests.

Table 10
ExxonMobil
Sensitivity of Equity Values ($ billions) to the Value Drivers

% Change	g_s	V_0	m_s	V_0	T	V_0	k	V_0	I_s	V_0	n	V_0
-20%	4.08%	$259.1	13.20%	$254.3	30.40%	$301.1	7.34%	$331.3	3.80%	$296.8	8.80	$275.4
-14%	4.39%	$266.2	14.19%	$263.0	32.68%	$295.7	7.89%	$316.0	4.09%	$292.7	9.46	$277.8
-10%	4.59%	$270.9	14.85%	$268.8	34.20%	$292.2	8.26%	$306.2	4.28%	$290.0	9.90	$279.4
-6%	4.79%	$275.8	15.51%	$274.6	35.72%	$288.6	8.63%	$296.8	4.47%	$287.3	10.34	$281.0
-4%	4.90%	$278.3	15.84%	$277.5	36.48%	$286.8	8.81%	$292.2	4.56%	$286.0	10.56	$281.8
-2%	5.00%	$280.8	16.17%	$280.4	37.24%	$285.1	9.00%	$287.7	4.66%	$284.6	10.78	$282.5
0%	5.10%	$283.3	16.50%	$283.3	38.00%	$283.3	9.18%	$283.3	4.75%	$283.3	11.00	$283.3
2%	5.20%	$285.8	16.83%	$286.2	38.76%	$281.5	9.36%	$279.0	4.85%	$281.9	11.22	$284.0
4%	5.30%	$288.4	17.16%	$289.1	39.52%	$279.7	9.55%	$274.7	4.94%	$280.6	11.44	$284.8
6%	5.41%	$291.0	17.49%	$292.0	40.28%	$278.0	9.73%	$270.5	5.04%	$279.2	11.66	$285.5
10%	5.61%	$296.2	18.15%	$297.8	41.80%	$274.4	10.10%	$262.4	5.23%	$276.6	12.10	$287.0
14%	5.81%	$301.5	18.81%	$303.6	43.32%	$270.8	10.47%	$254.6	5.42%	$273.9	12.54	$288.5
20%	6.12%	$309.7	19.80%	$312.3	45.60%	$265.5	11.02%	$243.3	5.70%	$269.8	13.20	$290.6

Elasticities						
+20%	0.466	0.512	-0.314	-0.704	-0.238	0.129
-20%	0.427	0.512	-0.314	-0.847	-0.238	0.139

Illustration of calculation of elasticity for n and V:

Elasticity of V wrt $n = (\Delta V / V)/(\Delta n / n) = [(290.6–283.3)/283.3]/[(13.2–11.0)/11.0] = (7.3/283.3)/(2.2/11.0) = 0.02577/0.20 = 0.129$

The table shows that for the value drivers with positive elasticities, the profit margin (m_s) and the growth rate in revenues (g_s) have the greatest influence. The cost of capital (k) has the greatest negative relationship with value. These numerical relationships are specific to the magnitudes of the value drivers in Table 9, Panel A. The signs of the relationships will always hold. More general expressions for the elasticities can be obtained by taking the derivative of value with respect to (wrt) each of the value drivers in the formula shown in Table 9, Panel B.

Table 11
DCF Sensitivity Matrix
ExxonMobil Corp

Discount Rate, k_s	Equity Value ($ billions)				
	Net Operating Income Margin, m_s				
	10.5%	12.5%	16.5%	18.5%	20.5%
7.50%	$269.3	$288.5	$326.9	$346.1	$365.3
8.00%	$257.0	$275.7	$313.1	$331.8	$350.6
8.50%	$245.4	$263.6	$300.1	$318.3	$336.5
9.00%	$234.4	$252.1	$287.6	$305.4	$323.1
9.18%	$230.5	$248.1	$283.3	$300.9	$318.5
9.50%	$223.9	$241.2	$275.8	$293.1	$310.4
10.00%	$213.9	$230.8	$264.5	$281.4	$298.3
10.50%	$204.5	$220.9	$253.8	$270.3	$286.7
11.00%	$195.5	$211.5	$243.6	$259.7	$275.7

Net Operating Margin, m_s	Equity Value ($ billions)				
	Revenues Growth Rate, g_s				
	3.00%	4.00%	5.10%	6.00%	7.00%
13.0%	$208.2	$228.3	$252.5	$274.1	$300.2
14.0%	$216.1	$236.6	$261.3	$283.4	$310.0
15.0%	$223.9	$244.9	$270.1	$292.6	$319.7
16.0%	$231.8	$253.2	$278.9	$301.8	$329.4
16.5%	$235.7	$257.3	$283.3	$306.4	$334.3
17.0%	$239.7	$261.5	$287.7	$311.1	$339.2
18.0%	$247.5	$269.8	$296.5	$320.3	$348.9
19.0%	$255.4	$278.0	$305.3	$329.5	$358.7
20.0%	$263.3	$286.3	$314.1	$338.7	$368.4

Table 12
Tests of Merger Performance – Exxon / Mobil Example
Values in $ Billion

	Market Caps		Ownership Proportions
Premerger			
Exxon	$ 175.0		74.9%
Mobil	$ 58.7		25.1%
Total	$ 233.7		100.0%
Postmerger			
Combined Value	$ 283.3		
Paid to Mobil	$ 74.2		
Remainder	$ 209.1		
Exxon Premerger	$ 175.0		
Gain from Merger		$ 34.1	
Portion to Exxon 70%		$ 23.9	
Portion to Mobil 30%		$ 10.2	
Plus Premium to Mobil		$ 15.5	
Mobil Total Gain		$ 25.7	

Table 13
Value Changes in 9 Major Oil Industry Mergers, 1998-2001
(in $ Billions)

		Announcement	Market Cap, -10 days			Value Changes (-10,+10)		
Target	Acquirer	Date	Target	Acquirer	Combined	Target	Acquirer	Combined
Amoco	BP	8/11/1998	38.7	79.7	118.4	10.6	1.9	12.5
PetroFina	Total	12/1/1998	8.1	29.6	37.7	2.5	(4.7)	(2.2)
Mobil	Exxon	12/1/1998	56.7	173.7	230.3	11.7	5.4	17.1
Arco	BP	4/1/1999	20.8	161.5	182.3	4.7	7.9	12.6
Elf Acquitaine	TotalFina	7/5/1999	41.6	46.2	87.8	5.9	(3.2)	2.7
Texaco	Chevron	10/16/2000	29.4	56.6	86.0	3.8	(1.1)	2.7
Tosco	Phillips	2/4/2001	5.0	14.0	19.1	1.2	(0.2)	1.0
Gulf Canada	Conoco	5/29/2001	3.0	19.2	22.2	1.1	(0.3)	0.7
Conoco	Phillips	11/18/2001	15.5	20.6	36.1	2.3	2.1	4.5
Totals			218.8	601.1	819.9	43.8	7.8	51.6

Market capitalizations are calculated 10 days before the merger announcement date. The value changes are calculated from 10 days before the announcement date to 10 days after. The measurement of the value changes adjust for market changes using the Dow Jones Major World Oil Companies Index (DJWDOIL).

Table 14
Effects of Mergers on Oil Industry H Index Measures

	Combined Revenues (millions)	Sum of Initial Hs	New H Index	Change in H Index	Cumulative Levels of the Oil Industry H Index
Original H Index	.....				389.35
BP/Amoco	123,871	41.27	70.45	29.18	418.53
Total/PetroFina	53,133	6.84	12.96	6.12	424.66
Exxon/Mobil	203,148	106.43	189.49	83.06	507.72
BP Amoco/ARCO	143,143	72.16	94.08	21.92	529.64
TotalFina/Elf Aquitaine	98,220	22.30	44.30	22.00	551.64
Chevron/Texaco	88,617	18.08	36.06	17.98	569.62
Phillips/Tosco	43,870	4.48	8.84	4.36	573.98
Conoco/Gulf Canada	22,622	2.11	2.35	0.24	574.22
Phillips/Conoco	66,492	11.19	20.30	9.11	583.34

Note: Total oil industry revenues were $1,475,774 million in 1997.