Keller Graduate School of Management

FI561 – Corporate Investment Analysis

Analysis of the

Exxon Mobil Merger

By

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Exxon Mobil Merger Analysis

The acquisition of Mobil Corporation by Exxon Corporation is one of the largest mergers in the history of the oil industry and rejoins the two largest of the companies that resulted from the 1911 breakup of the Standard Oil Trust. According to Mergerstat, this merger has a value of $77.213 billion and is the largest merger and acquisition (M&A) deal of 1998[1]. This analysis reviews available industry and company data and determines the valuation is reasonable, given the financial and operating synergies of the companies.

This analysis discusses the industry and company background of the companies; valuation of the merger, using the comparative companies, formula, and Rappaport approaches; and then analyzes the strategic benefits, value factors, and risks of merging the Exxon and Mobil corporations.

Industry and Company Background

The integrated oil operations industry is a worldwide industry where economies of scale provide significant operational efficiencies. Prior to the Exxon Mobil merger, the largest non-governmental oil company was Royal Dutch Shell, a joint venture of the Royal Dutch Petroleum Company and the Shell Transport and Trading Company. In addition to Exxon Mobil and Royal Dutch Shell, other industry competitors, such as British Petroleum and Amoco, and Total and PetroFina, are also joining forces to gain competitive advantages. This section provides an overview of the integrated oil operations industry and an introduction to both Exxon and Mobil corporations before we begin the detailed valuation and analysis of the merger.

Industry Overview

The operations of the Oil Industry can be dissected into three domains: upstream operations, downstream operations, and petrochemicals. The upstream operations include exploring for and producing crude oil. Traditionally, this area had the highest return on investment. The downstream operations include refining and marketing. Finally, the chemical synthesis of plastics such as ethylene, propylene, polyethylene and polypropylene is a huge, still growing market. Companies in the oil industry compete in each of these sectors of operations with other companies, some of which specialize more or less in one sector e.g. petrochemicals. A characteristic of the industry is the high cost of replacing assets such as oil fields. Nevertheless, if companies want to expand or a least maintain their market share, they need to either replace some too old to be productive assets or merge in order to grow and minimize cost. Cost minimization is the greatest driving force for the recent mergers in the industry.

Recent developments in the global market have resulted in record low oil prices. Strong increases in worldwide production, in combination with the economic difficulties in Asia, have resulted in an oversupply. The failure of the OPEC countries to abide by their commitments to reduce production as well as the overproduction of oil by Russia in a desperate attempt to generate foreign currency has aggravated the situation. China stopped the imports of oil during the fourth quarter of 1998 in order to conserve dollars. Furthermore, the unusually mild winter in North America resulted in even lower demand. Projections for future oil prices are pessimistic for the oil companies; it is quite likely that oil prices will remain low for a number of years. The low price of oil is detrimental for the American companies with high production costs.

While there is currently a glut of oil on the world market, upstream production of oil is a capital-intensive business with substantial risks. Although oil can be found in many parts of the world, many of today's most productive oil fields are under the sea, in the Middle East, Africa, Central and South America, or in central Asia. In addition to the risk of exploring and drilling, the logistics and technical problems of extracting oil from these areas present substantial challenges as firms begin tapping less productive second-tier fields. These problems include extreme environmental conditions to reach oil in undersea fields or in pristine wilderness regions without damaging unique natural areas, governmental instability, and the difficulties of supplying personnel and highly technical equipment to remote locations.

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[1] Source: Mergerstat Report of Top 10 Deals for 1998, http://www.mergerstat.com/media/TopDeals.html, January 4, 1999.

The approximate cost of production in American companies is $12 per barrel. This means that companies have to sell below their cost! The low oil prices led to major restructuring in the industry. Merging companies reduce the cost of operations by eliminating redundant departments such as geology and marketing, and provide access to more ample resources. Table 1[2] shows the major companies in the industry. Given the high cost of investment required for entry that functions as a barrier and the limited number of companies in the field, anti-trust regulations become of importance. The outcome of the mergers will be a very small number of multibillion giant companies that will benefit for the economies of scale and will survive the tough conditions of the market.

OTHER INDUSTRY PARTICIPANTS

Principal Peer Group	Stock Symbol	Recent Stock Price	P/E Ratio	12-mth. Trail. EPS	30-day Price Chg %	1-year Price Chg. %	Beta	Yield %	Quality Ranking	Stk. Mkt. Cap. (mil. $)	Ret. on Equity %	Pretax Margin %	LTD to Cap. %
Exxon Corp.	**XON**	**76**	**25**	**2.99**	**7%**	**23%**	**0.65**	**2.2**	**A**	**184,620**	**19.5**	**9.8**	**10.6**
"Shell" Transport & Trading	SC	36⅞	27	1.35	2%	-17%	0.98	3.5	A	61,111	12.0	136.1	7.3
Amoco Corp.	AN	57¼	31	1.82	-5%	37%	0.31	2.6	B+	54,654	16.6	11.8	19.7
British Petroleum	BP	89	25	3.55	-6%	10%	0.63	2.7	NR	85,478	18.4	8.4	17.0
Chevron Corp.	CHV	83	23	3.67	3%	12%	0.61	2.9	B+	54,153	19.7	13.6	17.6
ENI S.p.A.	E	63	17	3.62	8%	11%	NA	1.7	NR	50,395	14.9	15.9	22.9
Elf Aquitaine	ELF	54¼	30	1.81	-14%	-4%	1.14	2.0	B-	29,803	6.8	7.5	19.3
Imperial Oil	IMO	17	11	1.55	-3%	-19%	0.50	2.8	B+	7,414	18.9	14.3	36.6
Mobil Corp.	MOB	90⅛	29	3.14	23%	27%	0.53	2.5	A-	70,673	17.3	9.9	13.6
PetroFina S.A.	FIN	44⅛	19	2.35	22%	16%	NA	2.1	NR	10,377	14.4	5.8	18.5
Repsol, S.A.	REP	54¼	20	2.76	2%	28%	1.01	1.8	NR	16,275	14.2	6.6	28.2
Royal Dutch Petroleum	RD	48	29	1.65	1%	-11%	1.05	2.9	A	102,926	12.3	11.9	7.3
Shell Canada	SHC	23⅛	16	1.42	-3%	-11%	NA	3.1	B	6,710	14.8	16.3	15.6
TOTAL	TOT	49⅝	19	2.57	-19%	-6%	0.87	1.9	NR	24,128	11.8	6.3	24.3
Texaco Inc.	TX	52⅛	20	2.58	-10%	-2%	0.50	3.4	B	28,130	24.1	7.5	26.5
YPF Sociedad Anonima	YPF	27	14	1.88	-5%	-15%	1.31	3.3	NR	9,553	13.1	22.1	20.4

TABLE 1: Major companies in the Oil Industry

Downstream, the process of refining and marketing oil products is a cutthroat industry where customers switch suppliers to save pennies on the gallon. Most oil products, such as gasoline, heating oil, and, to a lesser extent, lubricants, are fungible commodities with no discernible difference between one supplier's product and another. As a result, the low cost producer can reap higher profits and force competitors to meet its terms. While some operating efficiencies can be achieved through cost cutting and process redesign, greater efficiencies can frequently be achieved only through economies of scale, as fixed costs are spread over larger volume of sales.

Petrochemicals are a smaller part of the industry's output, but they provide some opportunities for differentiation among companies. Research and development of new chemicals lead to new applications and, in many cases, patentable or proprietary products. This business is competitive, cyclical, and fast-moving, requiring companies to pursue constant innovation to create and maintain any advantage.

Exxon Corporation[3]

One of the world's largest companies, Exxon has operations throughout the petroleum industry, from exploring for and producing oil and natural gas in 26 countries to refining and marketing operations in 76 countries. Exxon operates the world's third largest petrochemical company and is the world's largest independent (non-utility) power producer and has a major presence in coal and minerals. Because of the cyclical nature of these businesses, their relative contributions vary widely from year to year.

[2] Source: Standard & Poor's Industry Outlook Report for Exxon Corporation, dated December 19, 1998.
[3] Source: Standard & Poor's Stock Report for Exxon Corporation, dated December 19, 1998 and Exxon Annual Report for 1997.

Exxon is second only to Royal Dutch/Shell in terms of the size of its oil and gas reserves: 6.2 billion barrels of crude oil and 26.1 trillion cubic feet of natural gas as of the end of 1997. This is about 14 years of production capability, a total well above the industry average that shows Exxon 's strength relative to its major competitors.

Results in 1997 were mixed. Lower oil and gas production and lower oil prices led to a 7.2% decline in exploration and production profits. However, refining and marketing earnings more than doubled, aided by the company's highest petroleum product sales volumes in 23 years and improved margins. Chemicals profits rose 14%, on higher volumes and improved margins with an overall increase in net income of 13% for 1997.

Despite its massive capital budget, Exxon has not only paid, but raised its dividend in each of the past 14 years. The dividend yield was 2.3% as of late October 1998, compared to the benchmark S&P 500 yield of about 1.5.

Exxon's corporate culture is best described by the slogan "put a tiger your tank." Efficiency oriented, Exxon puts a lot of emphasis on the quality of the product itself. Its corporate image is built on the power of its products which is also the focus of its marketing campaign. This rather conservative corporate culture helped in maintaining its stock resilient despite the problems of the industry. In comparison to other companies, Exxon has low debt and relatively high liquidity. The low cost of production that Exxon has attained is enviable. However, its conservatism prevented Exxon from replenishing its reserves in Asia, Europe, Canada and elsewhere. In addition, Exxon failed to get involved in some of the most exciting areas of global oil exploration in the Caspian Sea region. Exxon pays a lot attention in the downstream operations but lacks creativity in upstream operations. The corporate structure is rather hierarchical and conservative, yet evidently efficient.

Mobil Corporation[4]

Mobil Corporation, one of the world's largest oil companies, set for itself the ambitious goal to achieve an annual earnings growth in excess of 10% over the next five years. The company expects to achieve this by increasing oil and gas production, petroleum product sales and chemicals sales, all while cutting costs.

Like Exxon, Mobil is involved in all aspects of the oil industry, including exploration, production, refining and marketing, as well as being a major presence in the petrochemicals industry. In 1997, its worldwide net crude and natural gas liquids production averaged 928,000 barrels per day, up from 854,000 barrels per day in 1996, with U.S. production accounting for 26% of 1997 production. Mobil's net natural gas production was 4.56 billion cubic feet per day, of which 25% was produced in the U.S. Mobil's refinery runs totaled 2,191,000 barrels per day, and petroleum product sales were 3,337,000 barrels per day. Mobil concentrates its products on high-margin areas, where it is a leader, including synthetic lubricants and premium gasolines. Mobil's proven reserves make it one of the world's five largest non state-owned oil companies.

Mobil's chemical business makes and markets basic petrochemicals and leads the field in production and sales of polypropylene film, a food packaging product. Mobil's specialty products include synthetic lubricant base stocks and additives for fuels and lubricants. Mobil expects significant additional ethylene capacity to come on line in the U.S. in 1998, and its paraxylene capacity began operations in 1997. Mobil puts a lot of emphasis on exploration and research. In January 1998, Mobil announced that its capital and exploration budget for 1998 would total $5.9 billion, up from $5.3 billion in 1997. Of its total 1998 budget, $3.9 billion was allocated for exploration and production, $1.5 billion for refining and marketing, $0.4 billion for chemicals, and $0.1 billion for corporate activities.

Mobil is a company that values innovation and quality. It has invested on building a corporate image that combines friendliness to the environment and product quality. It is the *energy that makes the difference.* The overall culture is liberal. The management tries to create a climate of high performance and continuous improvement throughout the organization.

[4] Source: Standard & Poor's Stock Report for Mobil Corporation, dated December 19, 1998.

Merger Valuation

The following paragraphs illustrate three methods for estimating Mobil's value to Exxon. To estimate the value, we evaluate the Comparable Companies Approach, evaluating key market ratios of similar companies to estimate the value of the companies; the formula approach, where an estimates of company value are obtained from projection of historical financial data; and the Rappaport approach, which uses other valuation criteria to develop formulas and spreadsheets of relevant data.

Comparable Companies Approach

The Comparable Companies Approach to valuation relies on determining the average value for three key financial ratios to derive expected values for the companies to be valued. The ratios used in this valuation are the companies' Market Value to Sales ratio, Market Value to Book Value ratio, and Market Value to Net Income ratio, using each company's overall market capitalization as the market price of the company, rather than its share price. Since the values of financial ratios vary from industry to industry, identifying comparable companies requires evaluation of companies within the same industry as the companies whose value is being estimated.

To identify comparable companies to Exxon and Mobil, we selected companies within the Integrated Oil Operations industry, which is a global industry. However, since many of the companies within the industry are foreign, any estimate of company value that is expressed in foreign currency would be subject to fluctuations in exchange rates. Therefore, we also restricted our consideration to US companies, leaving us with Amoco, Chevron, and Texaco as three companies that are comparable in terms of their business and the global scope of their operations. Since Exxon and Mobil are large competitors within this industry, we have included them in deriving the averages of the valuation ratios.

Company	Revenue	Book Value	Net Income	Market Cap.	Market/ Sales	Market/ Book	Market/ Net Inc
Amoco Corp.	31.900	16.319	2.720	54.600	1.712	3.346	20.074
Chevron Corp.	33.600	17.590	3.256	54.300	1.616	3.087	16.677
Exxon	122.000	43.759	8.460	180.000	1.475	4.113	21.277
Mobil	57.100	19.508	3.272	69.000	1.208	3.537	21.088
Texaco, Inc.	35.900	12.325	2.664	30.400	0.847	2.467	11.411
				Average:	**1.372**	**3.310**	**18.105**

The previous table shows the factors and ratios for the comparable companies[5] (all dollar values are shown in millions). In applying these average ratios to Mobil, Exxon, and Exxon Mobil, the company that will result from their merger, we obtain the data shown in the following table.

Company	Revenue	Book Value	Net Income	Market/ Sales	Market/ Book	Market/ Net Inc	Average
		Group Average Factor:		1.372	3.310	18.105	
Exxon	122,000	43,759	8,460	167,384	144,842	153,168	**155,132**
Mobil	57,100	19,508	3,272	78,341	64,571	59,240	**67,384**
Combined	179,100	63,267	11,732	245,725	209,414	212,408	**222,516**

From these tables, using the Comparable Companies method of valuation, Mobil's value is between $59,240 million and $78,341 million, and is expected to be about $67,384 million. Exxon's value is between $144,842 million and $167,384 million, with an expected value of $155,132 million. The combined company, after the merger, will have a value between $209,414 million and $245,725 million, and can be expected to be $222,516 million. All of these estimated values assume that the combined

[5] Last 12-month Revenue and Market Capitalization are provided as reported by Baseline, Inc. to subscribers of E-Trade. Book Value and Net Income are provided as reported by E-Trade on December 27, 1998.

Exxon Mobil corporation will be of average efficiency and that no real operating or financial synergies will cause the company to deviate from the industry averages.

Formula Approach

The formula approach to valuation uses a number of factors derived from a company's historical financial data in a mathematical model to estimate the present value of the company's future cash flows. These factors, which include the company's compound annual growth rate (g), the rate of its investment as a percentage of earnings (b), the company's weighted average cost of capital (k), and its tax rate (T), are applied to the company's cash flows (X) to derive the value of the company (V). While several formulas may be applied, depending on what is known, the most useful formula is the one for supernormal growth over a reasonable period of projection, followed by no growth, where the residual value of the company is assumed to be undistinguishable from other factors affecting the company. The formula for estimating this value is shown in Equation 1. The values of each of these parameters, in the merger of Exxon and Mobil, are shown in Table 2, and their derivation is provided in Appendix I[6].

$$V_0 = X_0(1-T)(1-b)\sum_{t=1}^{n}\frac{(1+g)^t}{(1+k)^t} + \frac{X_0(1-T)(1+g)^{n+1}}{k(1+k)^n}$$

Equation 1-Supernormal Growth followed by No Growth

Factor	Exxon	Mobil	Combined
X	$ 22,467	$ 10,322	$ 32,789
T	35.50%	50.40%	35.50%
b	20.04%	-3.27%	14.23%
r	18.91%	-42.74%	25.84%
g	3.79%	1.40%	3.68%
k	12.80%	11.66%	11.66%
n	10	10	10
V	**$ 216,872**	**$ 43,086**	**$ 295,591**
	Value of Mobil to Exxon:		**$ 78,719**

TABLE 2: Formula Valuation Factors for Exxon and Mobil

Rappaport Approach

This valuation approach relies on the hypothesis that the value of a company is mainly determined by the after tax value of the projected future cash flows within the time "horizon" when the expected rate of return on incremental investment exceeds the minimum acceptable rate of return for the acquisition. Beyond the investment horizon, the value of the company equals the residual value defined as the value of the perpetuity of cash flows starting one period after the horizon date.

The value of the target company equals the present value of future cash flows, plus (+) the residual value of the company, plus (+) temporary investments not required for current operations of the target company, less (-) debt assumed.

We estimated the value of each of the two companies using the Rappaport approach (for details of the valuation, see Appendix II). Cash flows (CF) are defined as:

> CF=EBIT X (1-Income Tax Rate) + Depreciation & Other Non-Cash Charges Minus (-) Capital Expenditures Minus (-) Cash Required for an Increase in Net Working Capital

In order to project CFs, acquiring companies need to project sales (S), annual growth rate of sales (g), EBIT as a percentage of sales (p), income tax rate (T), capital investment required per dollar of sales increase (f),

[6] All data for Exxon Corporation is either taken or derived from the Standard & Poor's Stock Report for Exxon Corporation, dated December 18, 1998, unless otherwise noted. All data for Mobil Corporation is either taken or derived from the Standard & Poor's Stock Report for Mobil Corporation, dated December 18, 1998, unless otherwise noted. Detailed spreadsheets showing the full calculation of all data is provided in Appendix I of this paper.

and the cash required for net working capital per dollar of sales increase (w), of the acquired company under the new management. The CF is then discounted at the weighted average cost of capital of each company. In acquisitions, the values of these parameters are defined by the management of the acquiring company according to several scenarios (conservative, most likely or most optimistic) and their projections of the companies' efficiencies under the new management and the environment of the merged companies. Since we did not have access to Exxon 's expectations on the performance of Mobil after the merger, we relied on the available historical data to derive reasonable average values for these parameters (see appendix II). *So, the estimated value of Mobil will not represent its value after the merger*. However, it will provide the base value of Mobil that will allow us to estimate the premium of the buy-out (the difference of the price paid above this estimate).

Variables used for projections of cash flows	**EXXON**	**MOBIL**
Sales growth rate (g)	7.76%	3.72%
EBIT as percentage of sales (p)	12.98%	11.49%
Income Tax rate (T)	35.50%	50.40%
Working Capital increase per dollar of sales increase (w)* *see comment in appendix II*	7.50%	-22.46%
Average Depreciation per year	$ 5,119.70	$ 2,799.00
Capital Investment per dollar of sales increase (f)	28.69%	6.01%
Weighted Average Cost of Capital	12.80%	11.66%

Table 3: Variables Used for Cash Flow Projections

Using the above estimated parameters, the cash-flow statement projections were estimated for the next ten years. The present values of the future cash flows, as well as the residual value of the companies were estimated from the income statement projections (appendix II). We arbitrarily set the horizon date to ten years into the future since there is little (if any) accuracy of projections beyond that point. (The minimum pretax return on sales, P_{min}, needed to earn the minimum acceptable rate of return on the acquisition for each additional dollar of sales was found to be much lower than the average historical pretax return on sales, so it is quite safe to assume a horizon of 10 years.) The total value of each company equals the PV of all projected cash flows, plus the residual value, plus temporary investments not required for current operations, less interest bearing debt. Table 4 shows the value of the two companies as estimated using the Rappaport approach. It is important to note that we could not estimate the value of the temporary investments not required for current operations, so we omitted this factor from the valuation.

	Exxon	Mobil
Total PV of CFs	**$89,129.08**	**$38,265.42**
Year 10 operating earnings after tax	$ 23,889.84	$4,898.87
Discount factor for year 10	29.99%	33.19%
Cost of capital	12.80%	11.66%
Residual Value	**$55,964.45**	**$13,945.09**
LT Debt (1997)	**($7,050.00)**	**($3,760.00)**
COMPANY 's VALUE	**$138,043.53**	**$48,450.51**

TABLE 4: Rappaport Valuation of Exxon and Mobil

Analysis

Overall, companies in the oil industry are struggling to survive the lowest crude oil prices in over a decade. With March 1999 crude oil futures trading under $12 per barrel[7], profits for industry members are being squeezed severely. The financial situation in emerging markets, where much of the world's oil is produced, have led state-operated oil companies to produce and sell all oil they can in an effort to earn as much foreign currency as possible. While these producers would like to raise prices by limiting production, they

[7] Source: Bloomberg Energy web page, on January 20, 1999, crude oil futures were trading at $11.87 per barrel. http://www.bloomberg.com/@@zjhC1wQAdFPCRjr*/energy/index.html

have been unable to act in concert due to the high economic incentives of cheating on any cartel-established production limits.

Strategic Benefits of the Merger

In this environment of low prices, the companies that will be most profitable are those that can make themselves the most efficient. Exxon, as the largest U.S. oil producer has been effective at cutting waste and streamlining its operations, and it has achieved significant economies of scale. However, it is reaching the limit in this streamlining, where the marginal cost of further improvement is beginning to equal or exceed the savings produced. As a result, Exxon must achieve substantial growth to be able to achieve more scale economies.

In addition, in its quest for efficiency, Exxon has fallen behind in research and development on several fronts, notably its upstream processes for extracting oil from lower-grade oil fields and its downstream manufacturing of improved lubricants, both areas where Mobil has made significant breakthroughs. Mobil pioneered the carbon dioxide (CO_2) injection process and is an industry leader in this technique for extending the life of existing oil fields and opening up fields whose yield would otherwise be too low for profitability. Mobil is also leading the development of groundbreaking lubricants, such as Mobil 1, extending the life of automobile and industrial equipment by reducing wear on engine parts.

A third reason why Exxon is interested in merging with Mobil is because the industry expects Saudi Arabia to reopen its oil fields and operations to foreign companies. Even though they have the most productive oil fields in the world, Saudi oil operations are suffering from technological obsolescence. Industry observers expect the Saudis to begin seeking production partners within the next few years to reduce their risks and streamline their operations. By merging with Mobil, Exxon would become large enough that it may be able to convince the Saudis that it can manage a joint venture with Saudi Arabian oil officials rather than being part of a large syndicate. In addition, in the past, Mobil performed substantial work with the Saudi Oil Ministry and several of its executives have close ties with Saudi officials.

Value Factors

As discussed above, the value range for Mobil, as a standalone company is between $59 and $78 billion, as shown in the comparative company valuations above, and the combined company, Exxon Mobil, the value range is between $209 and $245 billion. Since this is a horizontal merger, there is an expectation of significant synergies between the companies. In addition to the strategic advantages identified in the preceding paragraphs, the ability to combine oil fields and reduce duplicative administrative functions increases Mobil's value to Exxon over its value to a company outside the industry. These qualitative benefits would indicate that the merged company should be more valuable than if the companies remained separate.

Figure 1--Recent Exxon and Mobil Price Charts

In addition to these qualitative factors, which provide possible indications of the increased value of the merger, the financial markets

reacted positively to the merger announcement. As shown by the lower chart in Figure 1[8], Mobil's stock price rose significantly on December 2, the day after the announcement. As the upper chart shows, Exxon's jumped up, then down, and ultimately resumed trading in the same range as before the announcement. The increase in Mobil's price while maintaining Exxon's price indicates that the market considers this merger to be one that creates value, and therefore, that Exxon is paying a fair price for Mobil.

Merger Risks

Unfortunately, any merger between two established companies creates challenges that must be overcome in order to achieve the projected benefits. These include creating a new/common culture as opposed to the distinct cultures of the independent companies, meeting regulatory and antitrust requirements to assure the continued functioning of a competitive marketplace, and retention of key personnel to reap the benefits of their knowledge and expertise.

The companies have significantly different corporate cultures. Exxon is a conservative company with a strong ethic of following the rules handed down from above, while Mobil is more liberal and expects individuals to think for themselves and develop their own solutions to the problems that arise.

On the regulatory front, as the top two U.S. oil companies, there are many markets throughout the United States where Exxon and Mobil dominate the sale of gasoline, either through directly-owned filling stations or through franchisees. It is highly probable that regulators will require divestiture of some filling stations and release of some franchisees from their contracts in order to maintain competitive markets.

The other key risk element is retention of key staff to ensure that Mobil's strengths are continued in Exxon Mobil. Most notable, from a strategic perspective, will be retention of Mobil executives with the knowledge of Mobil's markets and the market strategies that have enabled it to remain competitive. Mobil has exploited some market niches that Exxon has either not sold in successfully or has not attempted to participate in. Without these executives, Exxon Mobil will lose its hold on these markets as competitors seize on its weaknesses. Additionally, Exxon is purchasing Mobil's technology and research to bolster its lagging R&D program. Without the continuation of Mobil's leading engineers, Exxon will continue to lag the industry in this critical area.

Conclusion

Based on this analysis, we conclude that Exxon is paying a fair price for Mobil. The reported market price is within the value range specified by the comparable companies valuation and is within two percent of the value we obtained using the formula approach. In addition, the reaction of the financial markets to the merger announcement indicates that value is being created by this merger.

[8] Source: BigCharts, as presented online by E-Trade on January 30, 1999.

Appendix I

Derivation of Formula Method Valuation Factors

This appendix explains the procedures used to derive the factors used in the formula valuation of the merger between Exxon and Mobil[9]. The formula used for valuing the companies is the formula for a period of supernormal growth, followed by no additional growth, given in the following equation.

$$V_0 = X_0(1-T)(1-b)\sum_{t=1}^{n}\frac{(1+g)^t}{(1+k)^t} + \frac{X_0(1-T)(1+g)^{n+1}}{k(1+k)^n}$$

This equation estimates the value of a company based on its free cash flows, effective tax rate, investment rate, growth rate, and cost of capital.

Free Cash Flows

A company's free cash flows, X_0, are the basis for estimating its future value. This value, which is the sum of the net operating income and the depreciation expense, recognizes the cash value of the company in the year rather than using the economic value obtained by accounting for the reduction in value caused by the use of long-term assets. As shown in the attached spreadsheets for Exxon, Mobil, and the combined company, the starting value for this formula is the most recent value of the company's free cash flows.

Effective Tax Rate

A company's effective tax rate, T, varies from year to year as its opportunities to shield or defer taxes vary depending on the types of investments it makes, the tax treaties among the countries where it does business, and the nature of various business transactions it undertakes throughout the year. To obtain the tax rate for use in the above formula, we averaged the effective tax rate for each company for the 10 years prior to the merger. Since, in this merger, Exxon is the larger company and the acquirer, we used Exxon's tax rates for the combined company.

Investment Rate

To determine the investment rate, b, we first calculated the amount of annual investment for each company by subtracting the company's total capital for the previous year from its total capital for the current year. We also computed the companies' after tax Net Operating Income per year by multiplying its earnings before interest and taxes (EBIT) by the difference obtained by subtracting the effective tax rate from one: After-tax NOI = EBIT x (1 – T). Then, to obtain the average historical investment rate for the entire period, we divided the total investment by the total after-tax net operating income.

Growth Rate

Calculating the growth rate, g, posed a problem. The ideal method would have been to use the slope of a linear regression line as the rate of growth, but Mobil's growth rate is so flat that Excel's regression slope function returned a division by zero error. To work around this problem, we computed the profitability rate, r, and compute g using the formula $g = br$. To compute r, we computed the difference in after-tax net operating income for the most recent year and for the beginning of our historical period, 10 years earlier. We then divided this difference by the total amount of the investments made over the 10-year period. Finally, to obtain the growth rate, we multiplied this value for r by the value of b, obtained above.

[9] All data used in computing this valuation was obtained from the Standard & Poor's Stock Reports for the Mobil and Exxon corporations, dated December 19, 1998, except where otherwise noted.

The data used for deriving these factors, along with the derived values, is provided in the following tables.

Exxon Corporation

Year	Total Capital	Investment (Change in Capital)	Operating Income (EBIT)	Depreci-ation	Free Cash Flows (X)	Effective Tax Rate (T)	NOI After Taxes
1988	50,583		13,077	4,794	17,871	36%	8,369
1989	54,735	4,152	12,932	4,968	17,900	39%	7,889
1990	56,260	1,525	14,099	5,493	19,592	38%	8,741
1991	58,925	2,665	13,006	4,935	17,941	34%	8,584
1992	58,523	(402)	11,928	5,044	16,972	33%	7,992
1993	56,632	(1,891)	12,063	4,759	16,822	33%	8,082
1994	59,849	3,217	11,942	5,015	16,957	34%	7,882
1995	62,815	2,966	14,584	5,386	19,970	38%	9,042
1996	66,167	3,352	15,837	5,329	21,166	37%	9,977
1997	66,533	366	16,993	5,474	22,467	33%	11,385

Mobil Corporation

Year	Total Capital	Investment (Change in Capital)	Operating Income (EBIT)	Depreci-ation	Free Cash Flows (X)	Effective Tax Rate (T)	NOI After Taxes
1988	26,077		6,012	2,683	8,695	41%	3,547
1989	25,389	688	6,271	2,502	8,773	52%	3,010
1990	25,382	7	6,875	2,682	9,557	57%	2,956
1991	25,930	(548)	6,459	2,589	9,048	52%	3,100
1992	24,719	1,211	5,755	2,780	8,535	55%	2,590
1993	25,024	(305)	6,467	2,629	9,096	48%	3,363
1994	24,572	452	6,611	3,098	9,709	52%	3,173
1995	25,322	(750)	6,649	3,748	10,397	46%	3,590
1996	27,074	(1,752)	8,153	2,725	10,878	52%	3,913
1997	27,047	27	7,768	2,554	10,322	49%	3,962

Combined Exxon Mobil Corporation

Year	Total Capital	Investment (Change in Capital)	Operating Income (EBIT)	Depreci-ation	Free Cash Flows (X)	Effective Tax Rate (T)	NOI After Taxes
1988	76,660		19,089	7,477	26,566	36%	12,217
1989	80,124	3,464	19,203	7,470	26,673	39%	11,714
1990	81,642	1,518	20,974	8,175	29,149	38%	13,004
1991	84,855	3,213	19,465	7,524	26,989	34%	12,847
1992	83,242	(1,613)	17,683	7,824	25,507	33%	11,848
1993	81,656	(1,586)	18,530	7,388	25,918	33%	12,415
1994	84,421	2,765	18,553	8,113	26,666	34%	12,245
1995	88,137	3,716	21,233	9,134	30,367	38%	13,164
1996	93,241	5,104	23,990	8,054	32,044	37%	15,114
1997	93,580	339	24,761	8,028	32,789	33%	16,590

Valuation Factors

	X	T	b	r	g
Exxon	22,467	35.50%	20.04%	18.91%	3.79%
Mobil	10,322	50.40%	-3.27%	-42.74%	1.40%

Cost of Capital

The final term to be computed before we could use the above formula was k, the discount rate, or cost of capital. This value represents the companies' cost of obtaining additional capital, and is a weighted average of the cost of long-term debt and the cost of new equity for the companies, as shown in the following equation.

$$k = k_d(1-T)\left(\frac{D}{C}\right) + k_p\left(\frac{E_p}{C}\right) + k_e\left(\frac{E_c}{C}\right)$$

We computed the companies' cost of debt, k_d based on the coupon nature of corporate bonds. Unless it calls the bond, for the majority of corporate bonds, a company makes interest (coupon) payments throughout the term of the loan and repays the entire principal when the loan is due. As a result, the company's effective cost of debt can be computed by dividing its interest expense by the amount of its long-term debt. Since interest on corporate debt is tax deductible, we calculated the after-tax cost of debt by multiplying the cost of debt by the difference obtained by subtracting the effective tax rate from one. Since our purpose in deriving the cost of debt is to estimate the value of future cash flows, we used only the companies' most recent cost of debt. The following table shows the cost of debt for Exxon, Mobil for the past 10 fiscal years.

	Exxon			Mobil		
Year	Interest Expense	Long Term Debt	Cost of Debt	Interest Expense	Long Term Debt	Cost of Debt
1988	1,042	4,689	22.2%	943	6,498	14.5%
1989	1,378	9,275	14.9%	774	5,317	14.6%
1990	1,510	7,687	19.6%	707	4,298	16.4%
1991	1,141	8,582	13.3%	733	4,715	15.5%
1992	1,148	8,637	13.3%	612	5,042	12.1%
1993	1,055	8,506	12.4%	366	5,027	7.3%
1994	1,178	8,831	13.3%	496	4,714	10.5%
1995	1,104	7,778	14.2%	467	4,629	10.1%
1996	984	7,236	13.6%	455	4,450	10.2%
1997	415	7,050	5.9%	428	3,760	11.4%

The middle term of this equation refers to the cost of preferred equity, which is a hybrid between debt and equity. The company pays regular dividends on preferred stock at a specified rate, similar to a bond. However, preferred stock never becomes due, and is, instead, a perpetuity. In addition, dividends are paid to preferred shareholders on an after-tax basis. Both Exxon and Mobil have a small amount of preferred stock outstanding, apparently owned by their Employee Stock Ownership Plan (ESOP) retirement systems. However, since each company's preferred stock accounts for less than one percent of its total capital, we have ignored it in this valuation.

To compute the companies' cost of equity, we used the capital asset pricing model (CAPM), as follows.

$$k_e = R_f + \beta(R_M - R_f)$$

This formula relates a company's cost of raising equity capital to the risk-free rate of return that can be obtained from long-term (10-year) U.S. Treasury Bonds[10] and the risk premium provided by the equity markets, through the use of the company-specific term, beta. We used the returns provided by the Standard & Poor's Index of 500 common stocks[11] as a proxy for the equity markets to calculate the cost of equity using the CAPM. Our results are shown in the following table.

			Exxon	Mobil
		Beta:	0.65	0.53
Year	**Risk-Free Rate**	**Return on S&P 500**	**Cost of Common Equity**	**Cost of Common Equity**
1988	8.71%	15.93%	13.40%	14.59%
1989	8.52%	28.53%	21.53%	24.82%
1990	8.52%	-1.60%	1.94%	0.28%
1991	7.68%	28.01%	20.89%	24.24%
1992	6.63%	7.62%	7.27%	7.43%
1993	5.54%	9.81%	8.32%	9.02%
1994	6.91%	1.83%	3.60%	2.77%
1995	6.50%	32.45%	23.37%	27.64%
1996	6.34%	21.38%	16.12%	18.59%
1997	6.33%	30.30%	21.91%	25.85%
		Average:	**13.84%**	**15.52%**

To calculate each company's weighted average cost of capital, k, we multiplied the after-tax cost of debt for the most recent year, as discussed above, by the ratio of the company's debt to total capital and added the cost of equity, multiplied by its ratio of the company's total capital. To account for the volatility of returns for the S&P 500, especially since returns in the most recent three years have been significantly higher than historical averages, and because we are projecting future cash flows in an uncertain market, we used the average cost of equity over the past 10 years as the expected cost of equity for each company in the weighted average cost of capital. The calculation of the weighted average cost of capital is shown in the following table.

[10] The yield on 10-year U.S. Treasury Bonds for the past 10 years was obtained from the Federal Reserve Board of Governors' archive of historical data at http://www.bog.frb.fed.us/releases/H15/data/a/tcm10y.txt

[11] Monthly returns for the Standard & Poor's Index of 500 stocks were obtained from data provided online by S&P/BARRA at http://www.barra.com/MktIndices/dload_monthly_returns.asp This data was used to compute annual returns for the past 10 years.

Exxon Corporation

		Cost	% of Total Capital	WACC Term
Debt X (1 - T)	k_d	4.08%	10.6%	0.43%
Preferred Equity	k_p	0.00%	0.0%	0.00%
Common Equity	k_e	13.84%	89.4%	12.37%
Weighted Average Cost of Capital			k	**12.80%**

Mobil Corporation

		Cost	% of Total Capital	WACC Term
Debt X (1 - T)	k_d	5.65%	13.60%	0.77%
Preferred Equity	k_p	0.00%	0.00%	0.00%
Common Equity	k_e	12.60%	86.40%	10.89%
Weighted Average Cost of Capital			k	**11.66%**

Our objective in this valuation is to estimate the price that Exxon should pay for Mobil, we do not compute a weighted average cost of capital for the combined Exxon Mobil corporation. Instead, since Mobil is being acquired and is therefore the element of risk in the transaction, we use its cost of capital for valuing the combined company.

Appendix II

Derivation of Rappaport Method Valuation Factors

This appendix explains the procedures used to derive the factors used in the Rappaport approach for valuation of Exxon and Mobil[12].

Sales Growth Rate (g)

The sales growth rate was estimated as the rate that would result in a constant increase of sales during the entire period of the last decade [Total increase in revenue divided by the revenue in year minus 10, divided by (n-1) where n is the number of years. Effectively there were nine periods to estimate the rate of sales growth]. Alternatively, we could have estimated the sales growth rate for each period and then estimate the average. We decided not to take the average because of the unacceptably high standard deviation. As a matter of fact, the sales growth rate is only slightly higher when it is estimated over the entire decade than when the average of each individual year is used.

	Exxon			Mobil		
Year	Revenue	Increase in Sales	Percentage Increase in Sales (g)	Revenue	Increase in sales	Percentage Increase in Sales (g)
1988	79,557	-	-	48,198	-	-
1989	86,656	7,099	8.92%	50,220	2,022	4.20%
1990	105,519	18,863	21.77%	57,819	7,599	15.13%
1991	102,847	(2,672)	-2.53%	56,042	(1,777)	-3.07%
1992	103,160	313	0.30%	56,877	835	1.49%
1993	97,825	(5,335)	-5.17%	56,576	(301)	-0.53%
1994	99,683	1,858	1.90%	58,995	2,419	4.28%
1995	121,804	22,121	22.19%	64,767	5,772	9.78%
1996	131,543	9,739	8.00%	71,129	6,362	9.82%
1997	135,142	3,599	2.74%	64,327	(6,802)	-9.56%
		Growth Rate:	**7.76%**			**3.72%**

EBIT as Percentage of Sales (p)

The EBIT as percentage of sales was stable over the past decade for both companies. We calculated p for each year and then we estimated the average. The p value for Exxon is higher than Mobil's. As a result, provided that Exxon manages to attain a similar p value for the operations of Mobil after the merger, there will be a substantial increase of Mobil's value as a consequence of the acquisition.

[12] All data used in computing this valuation was obtained from the Standard & Poor's Stock Reports for the Mobil and Exxon corporations, dated December 19, 1998, except where otherwise noted.

Year	Revenue	Exxon Operating Income (EBIT)	EBIT as percentage of revenue	Revenue	Mobil Operating Income (EBIT)	EBIT as percentage of revenue
1988	79,557	13,077	16.44%	48,198	6,012	12.47%
1989	86,656	12,932	14.92%	50,220	6,271	12.49%
1990	105,519	14,099	13.36%	57,819	6,875	11.89%
1991	102,847	13,006	12.65%	56,042	6,459	11.53%
1992	103,160	11,928	11.56%	56,877	5,755	10.12%
1993	97,825	12,063	12.33%	56,576	6,467	11.43%
1994	99,683	11,942	11.98%	58,995	6,611	11.21%
1995	121,804	14,584	11.97%	64,767	6,649	10.27%
1996	131,543	15,837	12.04%	71,129	8,153	11.46%
1997	135,142	16,993	12.57%	64,327	7,768	12.08%
		Average:	**12.98%**			**11.49%**

Income Tax Rate (T)

The effective tax rate of each company was estimated as explained in appendix I.

Working Capital Increase per Dollar of Sales Increase (w)

We estimated the working capital (defined as the difference between current assets and current liabilities) increase over the entire period of ten years and then divided by the increase in sales during the same period of time. Interestingly, we noticed that in the case of Mobil, the working capital decreased over the ten years period despite the increase in sales. Mobil actually manages to maintain a negative working capital. Although this could have been potentially dangerous due to limited liquidity, it seems that this was a deliberate managerial strategy (probably resulting from low accounts receivable compared to accounts payable) to minimize financing costs! The increase in working capital per dollar of sales is needed for defining the horizon date (see below) and for the estimation of future cash flows.

	Exxon				Mobil			
Year	Current Assets	Current Liabilities	Working Capital	Revenue	Current Assets	Current Liabilities	Working Capital	Revenue
1988	14,846	17,479	(2,633)	79,557	11,178	10,255	923	48,198
1989	16,576	21,984	(5,408)	86,656	11,920	11,216	704	50,220
1990	18,336	24,025	(5,689)	105,519	13,231	13,653	(422)	57,819
1991	17,012	20,854	(3,842)	102,847	12,401	13,602	(1,201)	56,042
1992	16,424	19,663	(3,239)	103,160	10,956	12,629	(1,673)	56,877
1993	14,859	18,590	(3,731)	97,825	11,069	12,203	(1,134)	56,576
1994	16,460	19,493	(3,033)	99,683	11,181	13,418	(2,237)	58,995
1995	17,318	18,736	(1,418)	121,804	12,056	13,054	(998)	64,767
1996	19,910	19,505	405	131,543	12,895	15,248	(2,353)	71,129
1997	21,192	19,654	1,538	135,142	9,722	12,421	(2,699)	64,327
	WC Increase per Sales Increase:			**7.50%**				**-22.46%**

Capital Investment per Dollar of Sales Increase (f)

The change in total capital investment over the entire decade was divided by the total increase in sales over the same period of time. Thus, this parameter not only represents the capital investment historically

required per dollar of sales increase but also compounds any cost of increases for replacing existing capacity.

	Exxon		Mobil	
Year	Total Capital	Revenue	Total Capital	Revenue
1988	50,583	79,557	26,077	48198
1989	54,735	86,656	25,389	50220
1990	56,260	105,519	25,382	57819
1991	58,925	102,847	25,930	56042
1992	58,523	103,160	24,719	56877
1993	56,632	97,825	25,024	56576
1994	59,849	99,683	24,572	58995
1995	62,815	121,804	25,322	64767
1996	66,167	131,543	27,074	71129
1997	66,533	135,142	27,047	64327
Inv per Sales:		**28.69%**		**6.01%**

Average Depreciation per Year

Annual depreciation was estimated as the average of the annual depreciation during the last ten years. This estimate is rather reliable provided that the annual depreciation for both companies was quite stable over this time period.

	Depreciation	
Year	Exxon	Mobil
1988	4,794	2,683
1989	4,968	2,502
1990	5,493	2,682
1991	4,935	2,589
1992	5,044	2,780
1993	4,759	2,629
1994	5,015	3,098
1995	5,386	3,748
1996	5,329	2,725
1997	5,474	2,554
Average:	**5,120**	**2,799**

Weighted Average Cost of Capital (K)

The weighted average cost of capital was estimated as explained in appendix I. K was used to discount the future cash flows in order to get their present value. K also affects the residual value of the company (see below).

Minimum Pretax Return on Sales needed to earn the Minimum Acceptable Rate of Return on the Acquisition (P_{min})

P_{min} is the threshold pretax return on sales below which the acquisition does yield the minimum acceptable rate of return (as defined by the cost of capital). P_{min} is estimated by the formula:

$$P_{\min} = \frac{k(f+w)}{(1-T)(1+k)}$$

This parameter is critical for defining the horizon date. In the case of Exxon, P_{min} = 6.37%, substantially lower than the average ratio of operating income (EBIT) divided by revenue (approximately 13% for Exxon). In the case of Mobil, the parameter w is negative. As a result, P_{min} was negative which does not make sense. Even when we calculated P_{min} after omitting the Working Capital Increase per Dollar of Sales Increase (w), we found that P_{min} = 1.27%. Again this value is substantially lower than the average ratio of operating income (EBIT) divided by revenue (approximately 12% for Mobil).

Factor	Exxon	Mobil
f	28.69%	6.01%
w	7.50%	-22.46%
T	35.50%	50.40%
k	12.80%	11.66%
Pmin	**6.37%**	**1.27%**

Horizon Date

The horizon date is the date beyond which it makes no sense projecting the cash flows. Theoretically, it is the point in time when the marginal cost for the marginal increase in sales equals the cost of capital of the acquisition. Beyond this point, the company ceases growing because the return on sales equals the acceptable rate of return (P_{min} = k). In the case of Mobil and Exxon, the estimated P_{min} is low enough compared to the historical return on sales so that we can safely use a horizon of 10 years.

Cash-Flow Statements

The cash-flow statements of Mobil and Exxon were projected using the estimates for the growth rate of sales (g) and the EBIT as Percentage of Sales (p) assuming that these parameters will stay constant over the next ten years. Capital expenditures were estimated by the annual increase in revenues multiplied by the Capital Investment required per dollar of sales increase (f). The increase in working capital was calculated by multiplying the projected annual increase in revenue with the working capital per dollar of sales increase (w). In the case of Mobil, the parameter w was negative. Since we believe that it will be very difficult to sustain the rate of decrease in working capital as sales increase, we did not take increase in WC into account (resulting in more conservative valuation than if we had assumed a decrease in WC).

Projected Cash Flows for Exxon Corporation

YEAR	Sales	EBIT	Operating Earnings after Taxes	Depreciation	Capital Expenditures	Increase in Working Capital	CASH FLOW	PV of Cash Flow
1	145,633	18,903	12,193	5,120	3,010	787	13,515	11,981
2	156,934	20,370	13,139	5,120	3,242	848	14,169	11,135
3	169,112	21,951	14,158	5,120	3,494	913	14,871	10,361
4	182,236	23,654	15,257	5,120	3,765	984	15,627	9,653
5	196,377	25,490	16,441	5,120	4,057	1,061	16,443	9,004
6	211,616	27,468	17,717	5,120	4,372	1,143	17,321	8,409
7	228,037	29,599	19,092	5,120	4,711	1,232	18,268	7,862
8	245,733	31,896	20,573	5,120	5,077	1,327	19,289	7,359
9	264,802	34,371	22,169	5,120	5,471	1,430	20,388	6,896
10	285,351	37,039	23,890	5,120	5,895	1,541	21,573	6,469
						Present Value of Cash Flows:		$89,129

Projected Cash Flows for Mobil Corporation

YEAR	Sales	EBIT	Operating Earnings after Taxes	Deprec-iation	Capital Expend-itures	Increase in Working Capital	CASH FLOW	PV of Cash Flow
1	66,720	7,666	3,526	2,799	144	0	6,182	5,536
2	69,202	7,951	3,658	2,799	149	0	6,307	5,059
3	71,776	8,247	3,794	2,799	155	0	6,438	4,624
4	74,446	8,554	3,935	2,799	160	0	6,573	4,229
5	77,216	8,872	4,081	2,799	166	0	6,714	3,868
6	80,088	9,202	4,233	2,799	173	0	6,859	3,539
7	83,067	9,544	4,390	2,799	179	0	7,010	3,239
8	86,158	9,900	4,554	2,799	186	0	7,167	2,966
9	89,363	10,268	4,723	2,799	193	0	7,330	2,716
10	92,687	10,650	4,899	2,799	200	0	7,498	2,489
						Present Value of Cash Flows:		$38,265

Residual Value

This refers to the value of the company's operations beyond the horizon date. The residual value equals the value of the perpetuity of cash flows starting one period after the horizon date. The residual value was calculated as:

> Residual Value = (Year 10 operating earnings after taxes divided by the discount rate) X year 10 discount factor.

The year 10 discount factor equals the PV of year 10 cash flow divided by the nominal year 10 cash flow.

Company	Residual Value
Exxon	$ 55,964
Mobil	$ 13,945

Total Value of the Company

The total value of each company equals to the PV of all projected cash flows, plus the residual value, plus temporary investments not required for current operations, less interest bearing debt. We assume these temporary investments not required for current operations are zero.

Company	PV of Cash Flows	Residual Value	Temporary Investments	Long Term Debt	Total Value
Exxon	$89,129	$55,964	$0	$7,050	**$138,044**
Mobil	$38,265	$13,945	$0	$3,760	**$48,451**

Appendix III

Source Data

The following pages provide copies of the data and analyses used in developing this report.

1. Mergerstat Report of Top 10 Deals of 1998, as of January 7, 1999.
2. Standard & Poor's Stock Report for Exxon Corporation, dated December 19, 1998.
3. Standard & Poor's Stock Report for Mobil Corporation, dated December 19, 1998.
4. Baseline Report on Exxon Corporation, dated December 10, 1998.
5. Baseline Report on Mobil Corporation, dated December 10, 1998.