COMMUNICATIONS SATILLITE CORPORATION

AN ANALYSIS OF DR. WILLARD T. CARLTON'S DEBT EQUITY RISK PREMIUM APPROACH

I. STATEMENT OF PROBLEM

Did Professor Willard Carleton do a reasonable job of estimating the cost of common equity for Communications Satellite Corporation for 1964 - 1975?

II. FINANCIAL FRAMEWORK

Debt Equity Risk Premium

The financial framework used by Dr. Willard T. Carleton is the Debt Equity Risk Premium (DERP). The cost of equity equals the cost of debt plus an equity risk premium and is represented by the following equation:

$$K_e = K_d + ERP$$[1]

Cost of Debt

As shown above, the DERP model uses a firm's cost of debt as a starting point for the formula and adds a risk premium to it to determine the appropriate cost of equity. When the company has no debt to establish a starting point, the risk-free rate may be used instead, but to some disadvantage. There are similarities and differences between the risk-free rate of return and the cost of debt. They both account for the rate of inflation and long-term rates include a maturity risk premium. The cost of debt also includes a risk premium for the risk of liquidity,

[1] Brigham & Houston 2007

marketability, and default that is not a part of the risk-free rate. Government bonds can be used to determine the appropriate risk-free rate. Either T-bonds or T-bills can be used for this determination. The length of the project should play a part in deciding which Treasury instrument to use. When dealing with short-term rates, liquidity and marketability risks are typically increased, but default, maturity, and inflation risks are usually decreased.

Although the risk-free rate can be used as an estimated starting point for the Debt Equity Risk Premium framework, a company will have some degree of liquidity, marketability, and default risk not represented by a government rate. Because of this, using the risk-free rate is not always an accurate predictor of a firm's cost of equity. Using the firm's cost of debt is preferable to using the risk-free rate because it more accurately reflects the true financial risks faced by the company.

Equity Risk Premium

Based on the idea that an investor requires a high rate of return for assuming risk, a risk premium is added to the cost of debt. The risk premium is the difference between the cost of debt and the required return an investor would expect to take on greater risk.

The risk premium is usually determined a number of ways. One way to identify the risk premium is to take a historical average of the spread between the cost of debt and the return on equity. The use of historical risk premiums requires the assumption that current risk premium expectations are equal to the historical values chosen.[2] Another way to find this premium is to survey portfolio managers about their spread in expected returns between stocks and bonds. A third way to calculate the risk premium is to use the spread of a comparable company. According to Brigham and Houston, the typical risk premium usually falls between three to five percent.[3]

The difficulty with determining a risk premium is that business and financial risks vary according to time and industry. Premiums are also affected by investors' risk aversion. These problems with calculating the risk premium create a greater degree of variability.

The equity risk premium added to a risk-free security is not the same as the premium used with a corporate bond. Exhibit 1 shows the difference between these premiums. Equity

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2 Parcell, 1997

3 Brigham & Houston 2007

risk premium 1, added to the risk-free rate, includes a corporate bond risk premium and equity risk premium 2. This is due to greater degrees of risk for different types of investments.

Comparable Companies

When a company has not used debt financing to determine a cost of debt, instead of using the risk-free rate as a substitute, a firm can look to comparable companies as a possible alternative. No two companies will have the same risk factors or capital structure, but competitors within the same industry or facing the same degree of government regulation are optimal starting points. Another aspect of a firm's cost of debt with respect to comparables is its bond rating. Finding a company that has a comparable bond rating will provide insight as to the amount of debt to be used. Companies with matching bond ratings reflect similar financial risk. Since it is financial risk that drives default, marketability, and liquidity risk premiums, this makes an appropriate comparable an adequate predictor of the actual costs of debt expected.

Not only can comparables be used to determine the cost of debt, but they can also help establish a benchmark for finding an equity risk premium. An ideal comparable would have the same degree of business and financial risk and will reflect this in its risk premium. One way of identifying similar risks is by comparing companies' beta values. A beta value represents the volatility and sensitivity to changes in stock price. When comparing companies this way it is important to determine whether a beta value is leveraged or not. A leveraged beta has been modified to include a firm's expected debt. Only by comparing two leveraged or two unleveraged beta's can an accurate comparison be made. For formulas on calculating a leveraged or unleveraged beta, see Exhibit 2.

Not all companies make good comparables. There are some industries that have unusual and uncontrollable factors (like the utility industry). Due to government involvement, subsidies, unfair or illegal market practices, or other factors, these companies should not be used as comparables. The biggest advantage to using a comparable is that they share many of the same business risk factors, especially if they are within the same industry. Ideally, a good comparable would be in the same industry, have a matching bond rating and beta values, and operate in the same time period. A comparable like this would reflect both financial and business risk.

There are a number of underlying assumptions to consider when using this framework (see part IV). For a summary the DERP framework, please refer to the flowchart found in Exhibit 3.

III. APPLICATION OF THE FINANCIAL FRAMEWORK

Carleton's Approach

To determine whether Professor Carleton did a reasonable job in estimating Comsat's cost of equity using the debt equity risk premium method from 1964 to 1975, the components of this model should be analyzed separately to asses if the values he used were appropriate.

Dr. Carleton used the U.S. Treasury bond interest rate which was four percent in 1964 and he estimated the equity risk premium to be between two and four percent. Thus, he projected that Comsat's cost of equity was between six and eight percent with a midpoint of seven percent. Dr. Carleton used the following formula:

$$\mathbf{K_e = R_f + Equity\ Risk\ premium}$$

$$\mathbf{7\% = 4\% + 3\%}$$

Cost of Debt

The use of the U.S. Treasury bond as the cost of debt does not take into account the default risk differentials. Therefore, the use of the corporate bond reflects more accurately the risk that Comsat faces (Morin, 1994). If the risk free rate is used, the risk that a company faces is underestimated.

Equity Risk Premium

A proper equity risk premium would be one that reflects Comsat's financial risk and business risk. The financial risk of Comsat is practically zero because of its 100 percent equity capital structure, which was considered unreasonably conservative given that debt is less costly than equity. In fact, it adversely affected both ratepayers and stockholders. The commission recommended a debt-equity ratio of 45 percent in the determination of Comsat's rate of return for 1972.

According to studies (Malkiel 1979; Brigham, Vinson & Shome 1985; Harris 1986; Harris Marston 1992), the equity risk premium is generally between three percent and seven

percent. They determined ex ante risk premiums by estimating the market cost of equity for a particular time period, then subtracting the yield on debt as of the same time period.

Using Treasury Bills as the Cost of Debt

$$9.74\% = 4.21\% + 5.53\%$$

The cost of equity using T-bills is 9.74 percent. It was calculated by adding the risk-free rate, which was 4.21 percent to the equity risk premium, which was 5.53 percent. By using treasury bills, Comsat would be able to have more liquidity and marketability, but its default risk wouldn't be reflected. According to the Ibbotson 2000 Yearbook, the T-bill of 4.21 percent from 1956 to1975 was calculated taking the arithmetic mean of the percent per annum in these treasuries. On the other hand, the risk premium of 5.53 was estimated by computing the arithmetic average of the equity risk premiums from 1955 to 1975 (See Exhibit 4 for computation details).

Using Corporate Bonds as the Cost of Debt

$$13.06\% = 7.53\% + 5.53\%$$

The cost of equity using corporate bonds is 13.06 percent. It was calculated by adding the cost of debt, which was 7.53 percent to the equity risk premium, which was 5.53 percent. Utilizing the arithmetic average interest rate for Aa corporate bonds gives a better estimate of Comsat's financial risk, because it reflects the ability of the organization to make interest payments to bondholders. In fact, it represents the default risk of the firm. The cost of debt of 7.53 percent was determined by calculating the arithmetic mean in Aa utility bonds from 1967 to 1974 (See Exhibit 4).

Why AT&T was not an appropriate benchmark for estimating Comsat's allowable return for the period from 1964 to 1975?

To determine the equity risk premium, Dr. Carleton and the trial staff estimated that Comsat's risk was similar to AT&T's. We are to evaluate if Dr. Carleton did a good job in assessing Comsat's cost of equity given that he used AT&T as a comparable entity. Therefore, the estimation of Comsat's cost of equity would depend on how accurate the use of AT&T is as a benchmark.

Beta Analysis

To see if AT&T is a good comparable for Comsat, it is necessary to check their betas. In the case, the leveraged beta for AT&T is given (0.7) and to compare this beta with Comsat, the Hamada equation is used to find AT&T's unleveraged beta. The unleveraged beta is found by dividing AT&T's leveraged beta by [1+ (1-T) (D/E)] (see Exhibit 6). This calculation will result in AT&T's unleveraged beta (0.4375).

In comparing AT&T's unleveraged beta (0.4375) with Comsat's unleveraged beta (1.4), it is obvious that AT&T is not a good comparable for Comsat. Comsat has a lot more risk compared to AT&T. If the numbers for AT&T are used as an estimation of Comsat's numbers, the real risk of Comsat is going to be understated. The beta for AT&T is less than one, which means that it is less volatile than the market (less risky), but Comsat's beta is greater than one, which means that it is more volatile than the market (more risky). Comsat at 1.4, in theory, is 40 percent more risky than the market.[4]

Business Risk

- **Technological Risk:** Organizations that operate in the technological field face a high risk because the technology could become obsolete suddenly if a new breakthrough is discovered. Therefore, the faster a firm's product gets obsolete, the greater business risk the firm has. Comsat's satellite technology was a new and untried technology in the period (1964 – 1975). In addition, the risk of failure of launch was very high. In contrast, AT&T had been in business since 1885, thus it had a more mature and established product. In conclusion, Comsat faced a higher technological risk than AT&T.
- **Demand Variability Risk:** The more stable demand for a company's products, the lower the business risk, all else being equal. Comsat encountered difficulties in forecasting demand because its customers were a few large public utilities and had only a few years of relative growth. Conversely, AT&T had been a stable organization with constant demand and several years of consistent growth. In conclusion, AT&T was a mature business while Comsat was a relatively new company in its initial stages. Thus, there was not sufficient data to evaluate Comsat's variability.

[4] Kester, Ruback, & Tufano, 2005

- **Competitive Risk:** Comsat enjoyed a relatively monopolistic position in the satellite market; in fact, the company was the sole provider of the service. In addition, the organization had support from government agencies such as NASA. However, Comsat's principal customers were also its principal competitors. As a business that relies on technology, it faces the threat of becoming obsolete overnight if better technology is discovered by its competitors.
- **Regulatory Risk:** Regulations are considered legal restrictions promulgated by government authority. Thus, the most likely an organization is to be regulated, the greater the business risk it faces. It was well known that Comsat was expected to be regulated by the FCC, which could create great uncertainty among its stockholders. AT&T was also a regulated business; however, it was a well-established enterprise. The uncertainty around Comsat's regulation provided greater risk than that faced by AT&T.
- **International Risk:** As Comsat's management claimed in the case, "the international telecommunications market which Comsat served was fundamentally riskier than the domestic telecommunications market, AT&T's primary revenue base." In addition, Comsat depended on the cooperation of foreign entities. Comsat was designated the manager of INTELSAT, an international partnership for the purposes of owning and developing the global satellite system, which had an 84-nation membership by 1972. Therefore, each of these countries had special interest in the financial future of Comsat. On one hand, these 84 nations were likely to collaborate to facilitate Comsat's success, but also these countries wanted to take advantage of their business relationship with Comsat. It is not clear whether Comsat's international joint venture increased or decreased Comsat's business risk.

Financial Risk

Given the 100 percent equity of Comsat's capital structure, it did not face any financial risk. This means that Comsat's total risk was equal to its business risk. In contrast, AT&T's debt-to-capitalization ratio was about 50 percent. Not only was AT&T's financial risk greater than Comsat's, but AT&T also faced higher maturity, liquidity, and default risk premiums, interest expenses, etc.

IV. ASSUMPTIONS

The Debt Equity Risk Premium model has a number of underlying assumptions. These include:

- All numbers given in the case are accurate, and reflect the real financial statements of the company.
- Investors consider bonds as an alternative investment to common stocks on a risk-adjusted basis.
- There is more risk in common stock than bonds.
- The equity risk premium is constant over time.
- The return differential between stocks and bonds is measurable.
- Investors follow the present value theory of investment.
- The markets are efficient.
- Use of the historical risk premiums requires the assumption that current risk premium expectations are equal to the historical value chosen.
- The market is dominated by risk-averse investors; riskier securities must have higher expected returns as estimated by investors at the margin than less risky securities. If this situation does not exist, buying and selling will occur in the market until it does exist.
- The assumption was made that because of business risk and financial risk the equity risk premium for Comsat is going to be 5.6 percent.
- To calculate the cost of debt, Exhibit 4 was used, and the average of the Aa utility bonds from 1967-1974 is the best estimate the cost of debt for Comsat.
- To calculate the equity risk premium, the data from the SBBI (Stocks, Bonds, Bills & Inflation) 2000 yearbook was used and the average of the ERP from 1955-1975 was calculated.
- The data from the book SBBI (Stocks, Bonds, Bills & Inflation) 2000 yearbook is used and the risk-free rate was calculated as the average of the rate for treasury bills from the year 1956-1975.
- While using the Hamada equation to calculate the unleveraged beta for Comsat, the tax rate is assumed to be 40 percent.

V. CONCLUSION & RECOMMENDATIONS

In conclusion, Dr. Carleton did not do a reasonable job in estimating the cost of equity from 1964 to 1975. The primary reason for that was the fact that his approach omits the existence and underestimates the importance of business and financial risk. Especially while considering the elements of his formula, it becomes apparent that there is an oversight of financial risk. Furthermore, Dr. Carleton's approach has been held inaccurate because of the lack of strong evidence or explanation for the rates and assumptions (i.e. the percentage of the risk premium) that he used as the base of his solution to the case.

Comsat and AT&T had some similarities, for example, these companies were in the telecommunication business and they were subjected to government regulations. However, the use of AT&T as a benchmark to estimate Comsat's cost of equity is not suitable because there were more differences than similarities. Comsat was in the initial stage of the business life cycle, while AT&T was more mature. They also have different capital structures, which influences their levels of business and financial risk.

As a result, AT&T is not an accurate comparable for assessing Comsat's cost of equity. Neither the cost of debt nor the risk premium was estimated accurately by Dr. Carleton. The reason is the same, they lack the application of financial risk and several business risks discussed in part III above. Thus, the approximate calculation of the important elements of the formula brought the professor's solution to unrealistic results.

The thorough analyzes of the case made evident the fact that all financial models have strengths and weaknesses. They all depend on the correct judgment of the data to be used in the formulas. Thus, the recommendation is to compute all three methods used for the determination of the cost of equity: CAPM, DERP, and DCF.

Using all or several possible methods of computation of the cost of equity compensates for the drawbacks of one method with the strengths of the others. In fact, these three methods have advantages and disadvantages that should be taken into account while using them in practice:

- Strengths of the DERP method: the premium can be easily calculated based on historic data. It is also more appealing for investors because it is assumed that equity has more risk than debt.[5]

[5] Parcell, 1997

- Weaknesses of the DERP method: the premium is subjective and leads to the assumption that the future risk premium reflects the historic risk premium.
- Strengths of the DCF method: this model is forward-looking and recognizes the time-value of money. This is also the most company-specific method.
- Weaknesses of the DCF method: growth rates used are speculative and subjective. It is only applicable to companies that pay dividends.
- Strengths of the CAPM method: this, too, is a forward-looking method, which is company-specific.
- Weaknesses of the CAPM method: many underlying assumptions of this model do not reflect actual market conditions. Historic data used in this model may not apply to future operations.

Hence, the recommendation is to use the average of all three methods, which will help balance the various strengths and drawbacks of any one model, providing greater assurance for the correctness of the results.

By using the average of the three methods to determine the cost of equity (DCF, CAPM, and DERP) relative to Dr. Carleton's results, Professor Carleton did not take into account some important factors such as: Comsat's investment programs, the need for infrastructure investments to encourage economic development, and the financial health of the firm in the short and longer term.[6]

On the other hand, if Comsat does not award its stockholders with a reasonable return on equity given the company's business risk, it will have a directly adverse effect on the firm's earnings, reducing the availability of funds for system reinvestment. Eventually, it would also have a negative impact on Comsat's ability to raise capital from investors because of capital market expectations and reaction to ROE determinations.[7]

The challenge of the Federal Communication Commission is to award a return on equity that is suitable given Comsat's risks. If the return on equity is reasonable, Comsat is going to be able to provide a fair return to its investors. Thus, the return would be sufficient to assure confidence in the financial integrity of Comsat, so as to maintain credit and attract capital.[8]

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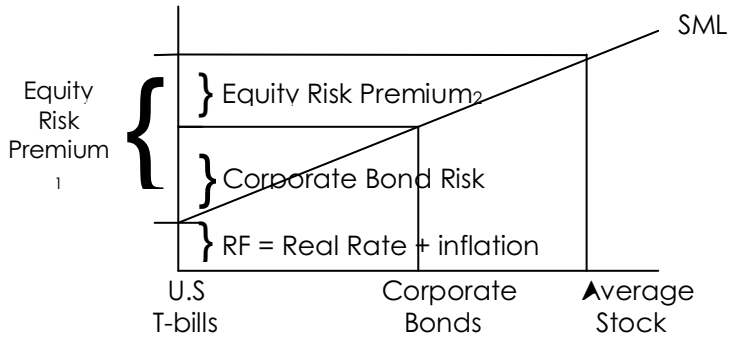
[6] Malko, Swensen, Monteleone 2007
[7] Ibid
[8] Malko 1984

Given Comsat's business risk, as shown in Exhibit 4E, a suitable return on Comsat's equity is 13.06 percent for 1975, in contrast, Dr. Carleton proposed 9.42 percent for the same year.

Therefore, taking into account all the differences between approaches for the computation of the cost of equity, the conclusion is that Dr. Carleton's approach is inaccurate. Moreover, paying attention to the importance of the financial and business risk is one of the primary concerns. Dr. Carleton's version underestimates these differences and presents relatively little risk forecasted in contrast to the real situation.

Exhibit 1 – Capital Market Line



$K_e = K_{rf} + ERP_1$ $\quad K_{rf} < Kd$

$K_e = K_d + ERP_2$ $\quad ERP_1 > ERP_2$

Exhibit 2 – Beta Leveraging/Unleveraging

$B_U = B_L/[1 + (1 – T)(D/E)]$ - For converting an unleveraged beta into a leveraged beta

$B_L = B_U[1 + (1 – T)(D/E)]$ - For converting a leveraged beta into an unleveraged beta

Exhibit 3 DERP Flowchart

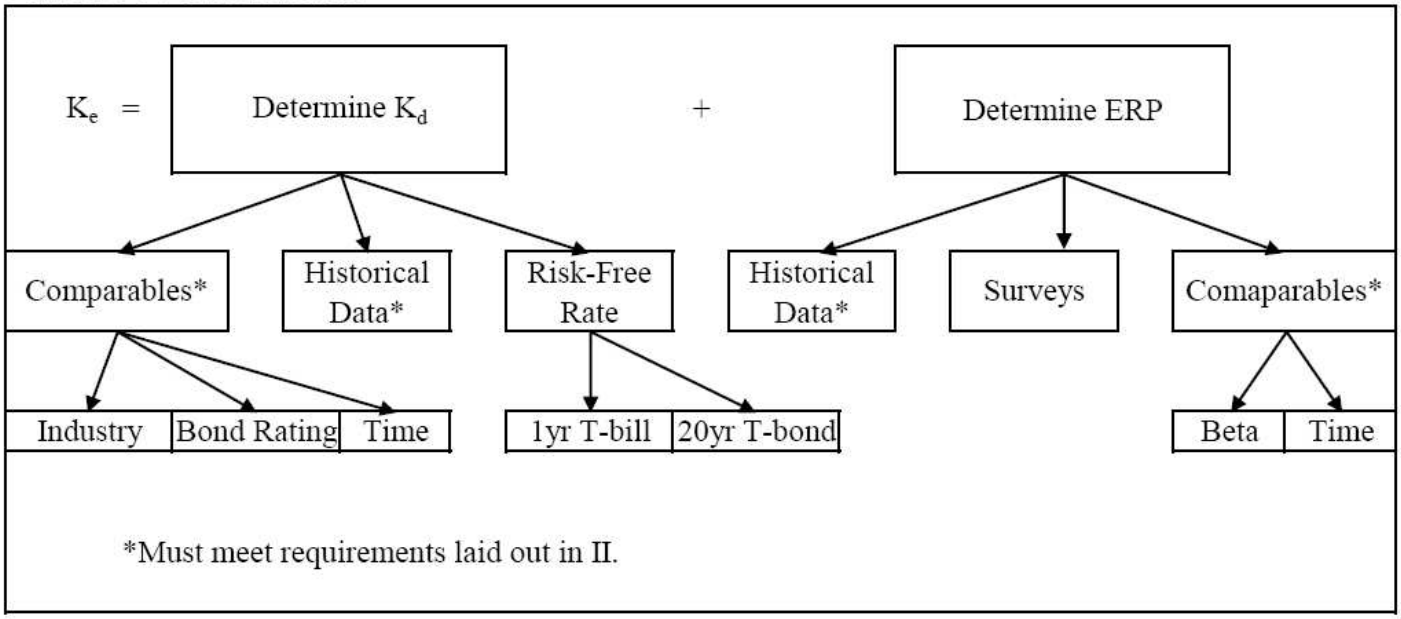


Exhibit 4 A & B – Capital Rates

EXHIBIT 1
Proposed Fair Rates of Return, 1964–1975

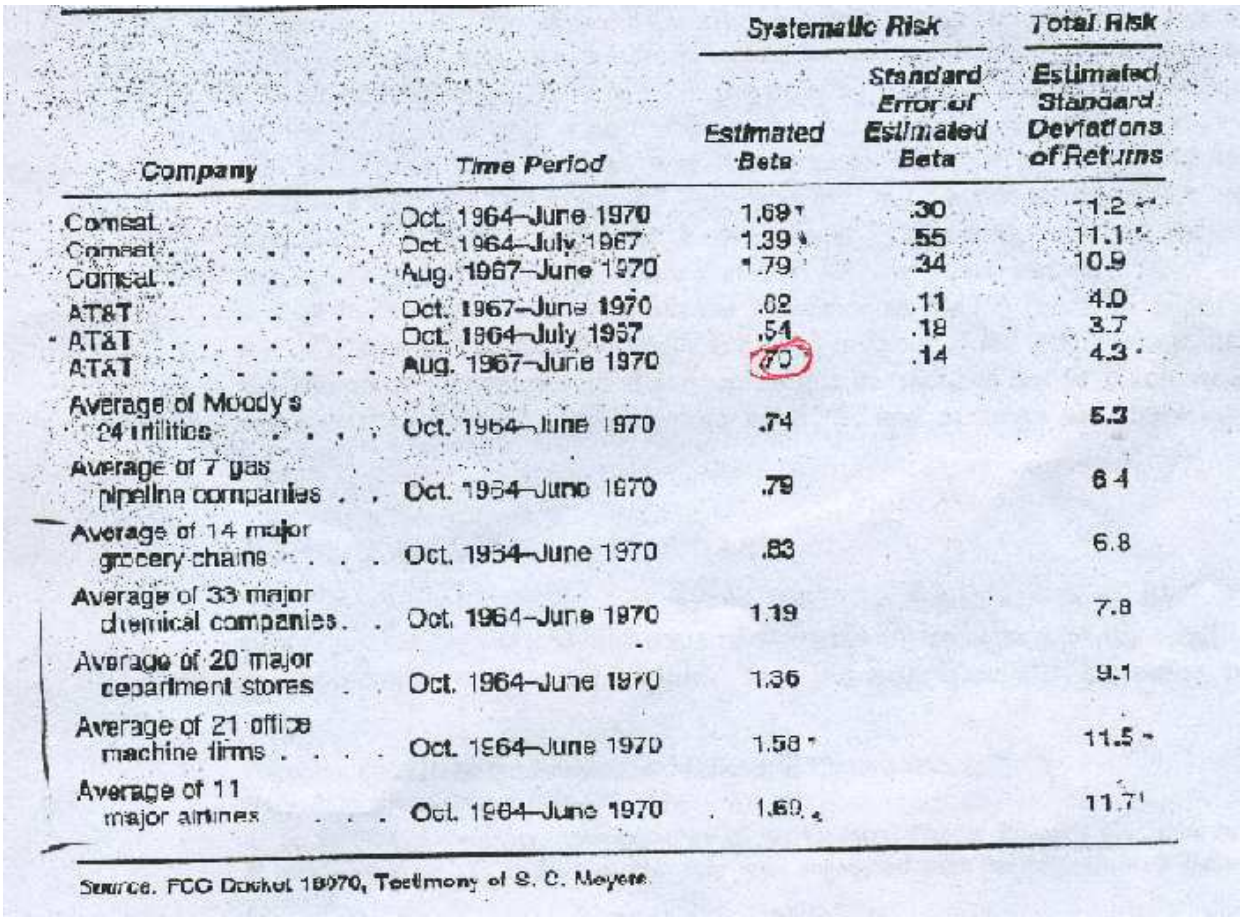
	Comsat Proposal	FCC Proposal
1964–1971	12%	7.00%
1972	12	8.33
1973	12	8.70
1974	12	9.15
1975	15	9.42

EXHIBIT 8
Annual Market Returns on Selected Securities, 1967–1974

	Comsat Common Stock	AT&T Common Stock	Moody's Industrials Common Stock Index	Baa Industrial Bonds	Aa Utility Bonds
1967	17.51%	−.92%	29.2%	6.21%	5.66%
1968	9.60	8.28	8.7	6.90	6.35
1969	5.07	−8.13	−5.4	7.76	7.34
1970	−12.06	4.00	3.0	9.00	8.52
1971	29.25	−2.87	14.8	8.37	8.00
1972	.65	25.03	19.7	7.99	7.60
1973	−37.51	−.71	−14.3	8.07	7.72
1974	−22.16	−1.52	−27.5	9.48	9.04
Average	−1.21	3.52	−1.52	7.97	7.39

Sources: Comsat's annual reports; *The Wall Street Journal*; AT&T's annual reports; *Moody's Industrial Manual* and *Moody's Public Utility Manual*.

Exhibit 4 C – Beta's



Company	Time Period	Systematic Risk: Estimated Beta	Systematic Risk: Standard Error of Estimated Beta	Total Risk: Estimated Standard Deviations of Returns
Comsat	Oct. 1964–June 1970	1.69	.30	11.2
Comsat	Oct. 1964–July 1967	1.39	.55	11.1
Comsat	Aug. 1967–June 1970	1.79	.34	10.9
AT&T	Oct. 1967–June 1970	.62	.11	4.0
AT&T	Oct. 1964–July 1967	.54	.18	3.7
AT&T	Aug. 1967–June 1970	.70	.14	4.3
Average of Moody's 24 utilities	Oct. 1964–June 1970	.74		5.3
Average of 7 gas pipeline companies	Oct. 1964–June 1970	.79		6.4
Average of 14 major grocery chains	Oct. 1964–June 1970	.83		6.8
Average of 33 major chemical companies	Oct. 1964–June 1970	1.19		7.8
Average of 20 major department stores	Oct. 1964–June 1970	1.36		9.1
Average of 21 office machine firms	Oct. 1964–June 1970	1.58		11.5
Average of 11 major airlines	Oct. 1964–June 1970	1.69		11.7

Source. FCC Docket 18920, Testimony of S. C. Meyers

Exhibit 4 D – Equity Risk Premium

Year	ERP
1955	29.52
1956	4.00
1957	-13.50
1958	41.19
1959	8.75
1960	-2.14
1961	24.25
1962	-11.16
1963	19.09
1964	12.50
1965	8.20
1966	-14.15
1967	18.87
1968	5.57
1969	-14.16
1970	-2.36
1971	9.51
1972	14.58
1973	-20.19
1974	-31.92
1975	29.68
Arithmetic Mean	5.53

Exhibit 4 E – Rate Summary

	Risk Premium		
	Carleton Approach	Using Treasury Bills	Corporate Bonds
K_d	4.00%	4.21%	7.53%
RP	3.00%	5.53%	5.53%
K_e	7.00%	9.74%	13.06%

Exhibit 5 – Beta Comparison

Unleverage Beta

$B_U = B_L/[1+(1-T)(D/E)]$

B_U for Comsat 1.4
B_L for AT&T 0.7
Debt Proportion for AT&T 0.50
Equity Proportion for AT&T 0.50
Tax Rate 0.40

B_U for AT&T= 0.7/[1+(1-0.4)(0.50/0.50)]
B_U for AT&T= 0.4375

BIBLIOGRAPHY

Brigham, E. F., & Houston, J. F. (2007). *Fundamentals of Financial Management* (5 ed.). (A. von Rosenberg, Ed.) Mason, Ohio: Thomson Higher Education.

Kester, W. C., Ruback, R. S., & Tufano, P. (2005). *Case Problems in Finance*. (M. Grosscup, Ed.) New York, New York: McGraw-Hill/Irwin.

Malko, R. J. (1984). The DCF method and regulated utility rate cases.

Malko, Swensen, Monteleone 2007 the electricity journal. Some thoughts on estimating the cost of common equity for a regulated business.

Morin, R. A. (1994). *Regulatory Finance: Utilities' Cost of Capital*. PUR

Parcell, D. (1997). *The Cost of Capital - A Practitioner's Guide*. Chapter 7 Comparable Earnings. Chapter 9 Risk Premium. SURFA.

Ibbotson Yearbook. (1999 & 2000).