Arizona Corporation Commission
US West Communications – Appendix B
Rebutal Testimony of Dr. Roger A. Morin
March 28, 1989

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APPENDIX B

THE RELATIONSHIP BETWEEN RISK AND RETURN

This appendix is divided into three segments. In the first segment, I describe the Capital Asset Pricing Model (CAPM) and address the implementation problems associated with each component of the CAPM. In the second segment, I demonstrate that the traditional Sharpe-Lintner version of the CAPM produces biased estimates of equity costs, and that the relationship between return and risk should be estimated empirically through the empirical form of the CAPM. (ECAPM). In the third section, I empirically derive a risk-return relationship for illustrative purposes, and propose a workable approximation to the observed risk-return relationship.

I. THE CAPM AND ITS COMPONENTS

A brief description of the CAPM is necessary at the outset. The conceptual underpinnings of the CAPM, a description of the underlying assumptions, and the formal derivation of the CAPM can be found in Morin, R.A. Utilities Cost of Capital, Public Utilities Reports Inc., Arlington, Va., 1984, Ch. 10.

The fundamental idea underlying the CAPM is that risk-averse investors demand higher returns for assuming additional risk, and higher-risk securities are priced to yield higher expected returns than lower-risk securities. The CAPM quantifies the additional return required for bearing incremental risk, and provides a formal risk-return relationship anchored on the basic idea that only market risk matters, as measured by beta. Securities are priced such that:

EXPECTED RETURN = RISK-FREE RATE + RISK PREMIUM

= RISK-FREE RATE + RELEVANT RISK x MARKET PRICE OF RISK

For a diversified investor, the only relevant risk is that which cannot be eliminated by diversification, that is, market risk or BETA. Therefore,

EXPECTED RETURN = RISK-FREE RATE + BETA x MARKET PRICE OF RISK

$$K = R_F + BETA(R_M - R_F) \qquad (1)$$

Equation (1) is the seminal CAPM expression. The CAPM asserts that an investor expects to earn a return, K, that could be gained on a riskless investment, R_F, plus a risk premium for assuming risk, proportional to the security's market risk, BETA, and the market price of risk, $R_M - R_F$.

Despite the conceptual appeal and mechanistic simplicity of the model, actual implementation of the model to estimate a fair return on equity presents practical difficulties. From the start, the CAPM model and its variants are expectational models (as with most valuation models in finance), while only historical data are available to match the theoretical input variables: expected risk-free return, expected beta, and expected market return. To stress this point, the following equation restates the CAPM formula with expectational operators attached to each input variable:

$$E(K) = E(R_f) + E(B) \times [E(R_M - E(R_F)] \qquad (2)$$

where $E(K)$ = expected return, or cost of capital

$E(R_F)$ = expected risk-free rate

$E(B)$ = expected beta

$E(R_M)$ = expected market return

None of the input variable exists as separate identifiable entities. It is thus necessary in practice to employ proxies, obtaining different results with each set of proxy variables.

I. (1) Risk-Free Rate

The best surrogate for the risk-free rate is the yield on default-free long-term Treasury bonds. The use of one-year Treasury bills as proxy for the risk-free rate in implementing the CAPM is questionable. Theoretically, the yield on short-term Treasury Bills is virtually riskless, devoid of default risk and subject to a negligible amount of interest rate risk. But the T-Bill rate fluctuates widely, leading to volatile and unreliable equity return estimates. Moreover, short-term Treasury Bills typically do not match the equity investor's planning horizon. Equity investors generally have an investment horizon far in excess of one year. More importantly, short-term Treasury Bills yields reflect the impact of factors different from those influencing long-term securities such as common stock. The premium for expected inflation impounded into short-term Treasury Bills is likely to be far different than the inflationary premium impounded into long-term securities yields. On grounds of consistency alone, the yields on default-free long-term Treasury bonds match more closely with common stock returns and are more appropriate. In my CAPM analyses, I use the current yield on long-term Treasury bonds as an estimate of the risk-free rate. Alternatively, an average of the yields on Treasury bonds futures contracts extending out 2 years in maturity could be used.

I.(2) BETA ESTIMATE

The true beta of a security can never be observed, in much the same way that the true expected growth rate in the DCF model can never be observed. Historically estimated betas serve only as proxies for the true beta.

Absolute estimates of beta may vary when different computational methods are used. The time period used, its duration, the choice of market index, and whether annual, monthly, or weekly return figures are used influence the final result. To enhance statistical significance, beta should be calculated with return data going as far back as possible. But the company's risk may have changed if the historical period is too long. Weighting the data for this tendency is one possible remedy, but this presupposes some knowledge on how risk changes. A frequent compromise is to use a five-year period with either weekly or monthly returns. Value Line betas are computed based on weekly returns over a five-year period using the New York Stock Exchange Stock Index; Merrill Lynch betas are computed with monthly returns over a five-year period using the Standard & Poor's 500 Industrials Index.

By construction, backward-looking betas are sluggish in detecting fundamental changes in a company's risk, even when estimated over sufficiently long periods using weekly or monthly returns. For example, if a utility suddenly increases its business risk or its debt to equity ratio, one would expect an increase in beta. However, if 60 months of return data are used to estimate beta, only one of the 60 data points reflects the new information, one month after the utility increased its risk level. Thus, the change in risk only has a minor effect on the historical beta. Even one year later, only 12 of the 60 return points reflect the event. Therefore, care must be taken when using historical betas for a company which has experienced a recent structural shift in fundamentals.

I. (3) MARKET RISK PREMIUM

The last required input to the CAPM is the expected risk premium on the market, $R_M - R_f$. Two methods of estimating this component are possible. The first method is to estimate the market return R_M, directly and then subtract R_f; the second is to estimate directly the market risk premium, $R_m - R_f$, as a whole. To estimate the latter, either historical risk premium results or expectational results can be used. In the case of historical risk premium results, it is assumed that investors anticipate about the same risk premium in the future as in the past.

The direct estimation of R_M can be achieved by applying the DCF methodology to a representative market index, such as the Standard & Poor's 500, Value Line Composite, or the New York Stock Exchange Index. For reasons of consistency, the market index employed should be the same as the market index used in deriving estimates of beta. A standard DCF with a 10-day average index value, an expectational dividend yield on the index adjusted for quarterly timing, and an aggregate composite growth estimate based on analysts' forecast, such as the composite 5-year earnings growth forecast in IBES, or Zacks' ICARUS data bases, could accomplish this.

I. (4) HISTORICAL MARKET RISK PREMIUM

The use of historical returns actually earned from investments in common equities and bonds in order to implement the CAPM can be expressed as follows:

$K_e = K_d$ + historical bond-equity spread

where K_e = cost of common equity

K_d = incremental cost of debt

Historical return data for common equities and bonds are compiled, and the historical mean return differential between stocks and bonds serves as the measure of risk premium. The historical return data typically originates from the landmark Ibbotson-Sinquefield [Stocks, Bonds, Bills, and Inflation: The Past and the Future, Charlottesville, Va: Financial Analysts Research Foundation, 1982, Monograph #15] study, which compared realized holding period annual returns on equities, government long-term and short-term securities, corporate bonds, and inflation from 1926 to 1982. Annual updates of the return results are published by Ibbotson-Sinquefield. Application of the method proceeds directly from the historical results. It is imperative that if historical risk premiums are to be relied upon, they be estimated over very long time periods. Only over long periods do investor expectations and realizations converge, or otherwise investors would not commit investment capital. Investor expectations are eventually revised to match historical realizations, as market prices adjust to bring anticipated and actual investment results into equilibrium.

One further issue relating to the use of realized returns is whether to use the arithmetic mean or the geometric mean return. Only arithmetic means are correct for forecasting purposes and for estimating the cost of capital. This is formally shown by Brealey & Myers ["Principles of Corporate Finance," Instructors' Manual, Appendix C, McGraw Hill 1984] and in Ibbotson Sinquefield, op. cit..

According to the 1987 edition of the Ibbotson-Sinquefield report, the average return on stocks in the 1926-1986 period was 12.1%, while the return on long-term government bonds was 4.7% over the same period, implying a risk premium of 7.4% for the average stock. The latter estimate can be used as an alternative to the direct expectational approach previously described.

II. THE EMPIRICAL CAPM

II. (1) EMPIRICAL VALIDATION OF THE SHARPE-LINTNER CAPM

There have been countless empirical tests of the Sharpe-Lintner CAPM to determine to what extent security returns and betas are related in the manner predicted by the Sharpe-Lintner CAPM. The results of these exhaustive tests, including those reported in the next section, support the idea that beta is related to security returns, that the risk-return tradeoff is positive, and that the relationship is linear. The contradictory finding is that the empirical risk-return relationship is not as steeply sloped as the predicted relationship. That is, low-beta securities earn returns somewhat higher than the CAPM would predict, and high-beta securities earn less than predicted. The slope is less than predicted by the CAPM, and the intercept term is greater than the risk-free rate. This is graphically depicted in Figure 1. This result is particularly crucial for public utilities whose betas are less than one. An estimate of cost of capital based on the Sharpe-Lintner CAPM underestimates the return required from such securities.

The empirical evidence also demonstrates that the return-beta relationship is unstable over short periods, and differs significantly from the long-run relationship. This evidence underscores the potential for error in cost of capital estimates which apply the CAPM using historical data over short time periods.

In short, the currently available empirical evidence indicates that the simple version of the CAPM does not provide a complete description of the process determining security returns. Reasons advanced for the inadequacies of the Sharpe-Lintner CAPM include the following:

1. Due to intertemporal effects not considered in the single-period CAPM, other sources of uncertainty besides market risk are significant in portfolio choice.[1]

2. Constraints on investor borrowing exist contrary to the assumption of the CAPM.

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1 For a summary of intertemporal CAPM theory and supporting evidence, see Morin, R. A. "Multiperiod Asset Pricing Theory: An empirical Test." Financial Management Association Meeting Oct. 1987, Center for the Study of Regulated Industry, Georgia State University, Working Paper 87-3.

3. The CAPM excludes other important variables which are important in determining security returns. Factors other than beta influence investor behavior, such as taxes and size.

4. The market index typically used in the empirical tests exclude important classes of securities, such as bonds, mortgages, and business investment.

II. (2) CAPM EXTENSIONS

Expanded CAPM models have been proposed which relax some of the more restrictive assumptions underlying the Sharpe-Lintner CAPM, and which enrich its conceptual validity. These expanded CAPM models typically produce a risk-return relationship that is flatter than the Sharpe-Lintner CAPM's prediction, consistent with the empirical findings.

The thrust of these expanded CAPM models is that beta is insufficient, and that other systematic risk factors affect security returns. The effects of relaxing the assumptions and introducing other independent variables should be quantified and used in estimating the cost of equity capital. The impact of the supplementary variables can be expressed as an additive element to the standard CAPM equation. Letting "a" stand for these other effects, the CAPM equation can be generalized as follows:

$$K = R_F + a + BETA\ (R_M - R_F) \qquad (3)$$

To capture the variables' impact on the slope of the relationship, a coefficient 'b' is substituted for the market risk premium. The generalized CAPM equation becomes:

$$K = R_F + a + b \times BETA \qquad (4)$$

The constants 'a' and 'b' capture market-wide effects which influence security returns, and which must be estimated by statistical techniques.

Empirical studies in finance have demonstrated that several factors besides beta influence security returns. Major factors include the hedging properties of assets against unforeseen changes in opportunities, constraints on investor borrowing, dividend yield as a proxy for tax effects, and size.

II. (3) ZERO-BETA VERSION OF THE CAPM

One of numerous versions of the CAPM developed by researchers which gives rise to a specific formulation of Equation (4) is the so-called zero-beta, or two-factor, CAPM. This version of the CAPM accounts for the effect of margin constraints on investor borrowing and for the existence of investment assets other than publicly-traded common stocks in a market where borrowing and lending rates are divergent. The model has the following form:

$$K = R_Z + BETA\ (R_M - R_Z) \qquad (5)$$

The model, christened the zero-beta model, is analogous to the standard CAPM, but with the return on a mininum risk portfolio which is unrelated to market returns, R_Z, replacing the risk-free rate, R_F. The model has been empirically tested by several researchers who found a flatter than predicted CAPM consistent with other researchers' findings. In view of the strong empirical support for the zero-beta version of the CAPM, the appellation Empirical CAPM is often attributed to this model.

Although the zero-beta CAPM cannot be literally employed in cost of capital projections, since the zero-beta portfolio is a statistical construct, attempts to estimate the model are formally equivalent to empirically estimating the coefficients 'a' and 'b' in Equation 4.

II. (4) APPROXIMATIONS TO THE EMPIRICAL CAPM

Approximations to the empirical CAPM have been proposed by assuming that the risk premium on a zero-beta asset is equal to the some fraction of the risk-free rate.

The results of the empirical tests reported below suggest that the following equation provides a workable approximation to the cost of equity capital:

$$K = R_F + 0.3\,(R_M - R_F) + 0.7\,BETA\,(R_M - R_F) \quad (6)$$

This approximation rests on the results of an empirical study described in the next section, which statistically relates historical realized returns on a large sample of common stocks to their historical betas. Based on a careful econometric study relating historical portfolio returns to their corresponding historical betas over a long historical period commencing in 1966, the approximation contained in Equation #6 fitted the observed return-risk relationship accurately, is consistent with the results of well-known empirical studies of the CAPM.

Comparing the cost of capital estimate from the standard CAPM of Equation (1) with the estimate from the above empirical approximation, the bias from using the Sharpe-Lintner CAPM can be quantified by subtracting Equation (1) from (6):

$$BIAS = 0.3\,(R_M - R_F)(1 - BETA) \quad (7)$$

The bias is thus positive for a public utility with a beta less than 1. For example, with a market return of 15%, a risk-free rate of 9%, and a beta of 0.80, the cost of equity estimate from the Sharpe-Lintner CAPM is underestimated by 36 basis points (0.36%).

II. (5) MULTIPLE-FACTOR CAPM APPROACH

An asset's hedging properties, tax status, and size are also important determinants of return. The empirical evidence on an asset's degree of protection against unforeseen changes in opportunities is discussed in Morin (1987), op. cit. The empirical evidence on the influence of dividend yields on investors' return requirements is surveyed in Brealey & Myers, Principles of Corporate Finance, McGraw Hill (1988), p. 372. One plausible reason for the dividend yield effect stems from the heavier taxation on dividend income relative to capital gains, which are not taxed until realized. This causes investors to require higher pre-tax returns in order to equalize the after-tax returns provided by high-yielding stocks with those of low-yielding stocks. This effect may have been palliated by recent changes in tax laws. Empirical studies have also found that returns are also affected by size, over and above the effect of beta. For example, the Ibbotson Associates, op. cit., 1987 historical return studies demonstrate that small firms have outperformed large capitalization stocks by about 6% in the 1926-1986 period. Franks, Broyles, and Carleton, Corporate Finance Concepts and Applications, Kent, 1985, p. 329, provide a brief survey of the literature on the size effect.

Equation 4, which can be estimated statistically from market data, offers a pragmatic solution to incorporate these various effects, which are telescoped into the two constants 'a' and 'b'.

III. CAPM EMPIRICAL TEST: DATA, METHODOLOGY, RESULTS

To obtain CAPM estimates of equity costs, I examined the statistical relationship between averaged historical market return and beta for a large sample of securities, using multiple regression techniques. The influence of dividend yield as proxy for tax effects on return was also examined.

III. (1) DATA AND VARIABLES

Data requirements include stock returns, market returns, risk-free interest rates and dividend yield data. The return and dividend yield data are extracted from the CRISP (Center for Research in Security Prices) tapes for the period 1/1960 - 12/1984. Only companies for which consecutive data for at least 60 months prior to the first month of each year and which were available in the Compustat tape were eligible to be in the sample for any given year.

For each company, return is measured as the change in total value over a given month, including dividends and capital gains. Dividend yield is the ratio of cash dividends paid in a given month and the month-end stock price. Monthly returns and dividend yields are summed across months to produce annual returns and dividend yields.

The market return in any given year is computed as the equally weighted average return of all securities listed on the NYSE in that year. The yearly betas for all securities in the sample with at least 60 consecutive months of data prior to that year are estimated from the traditional market model:

$$R_{i,t} - R_{f,t} = a + b_i(R_{M,t} - R_{f,t}) + e_{i,t} \quad (8)$$

where $R_{i,t}$ = realized return on security 'i' in month t

$R_{M,t}$ = realized return on the market index in month t

$R_{f,t}$ = risk-free rate in month 't'

$e_{i,t}$ = error term with zero mean and finite variance

III. (2) STATISTICAL METHODOLOGY

Securities are first grouped into portfolios based on beta, and dividend yield. The returns, betas, and dividend yields of the portfolios are then computed. The reasons for grouping securities into portfolios are: 1) to improve the statistical efficiency of the empirical test, given that the variance on a portfolio's return is far less than that of an individual security, 2) to attenuate measurement errors through diversification, 3) to produce unbiased estimates of return, beta, and dividend yield for a portfolio by giving equal weight to each security, and 4) to maximize the dispersion of beta, and dividend yield so as to facilitate detection of their relative effects.

The specifics of the methodology are as follows. For each year, Equation #8 is estimated for individual firms, using monthly returns over the previous 5 years. The dividend yield of the security is obtained as of the last year of the 5-year estimation period. Based on the ranked values of beta and dividend yield, the firms in the sample are cross-classified into 35 portfolios, 27 of which are made up of industrials and the remaining 8 of regulated companies. The securities are first ranked according to their estimated beta from minimum to maximum, and divided into beta groups. The securities in each beta group are ranked according to their estimated dividend yields from minimum to maximum, and divided further into sub-groups. Thirty-five portfolios of firms are thus obtained. This procedure is repeated each year based on the most recent beta and dividend yield. To produce efficient statistical estimators and to minimize the variance of portfolio return, portfolios are constructed with an equal number of securities each year. The return, beta and dividend yield of each portfolio are computed by averaging individual security values.

III. 3. EMPIRICAL RESULTS

Exhibits RAMAPP-1 and RAMAPP-2 presents various summary statistics regarding the 35 portfolios, including regression statistics on the market model (Equation #8), average yields, and returns. The estimated value of the intercept 'a' and its 't' statistic appear in columns 2 and 3 for each portfolio. The betas and their corresponding 't' statistic appear in columns 4 and 5. The coefficients of determination (R^2) are in column 6. Both the intercept, 'a', and the slope statistic ('b' or beta) are estimated by regressing the monthly excess return of the equally weighted market portfolio on the corresponding monthly excess return of the equally weighted market portfolio. The average dividend yield, 'd', shown in column 7 is computed by summing the annual yield of each portfolio and averaging over the entire period. The average returns on each portfolio are in column 8.

The portfolio data for industrials and regulated firms are pooled in Exhibit RAMAPP-3, yielding 35 portfolios. The returns, betas, and dividend yields are shown in the various columns for each portfolio. To test for the impact of beta on returns, cross-sectional regression is employed, using the column data of Exhibit RAMAPP-3. The following regression is run:

$$\text{RETURN} = a_0 + a_1\text{BETA}$$

The results are reported on the left-hand side of Exhibit RAMAPP-4, and shown graphically on Figure 2. The fitted relationship between return and beta is given by:

$$\text{RETURN} = .0829 + .0520\ \text{BETA} \qquad (10)$$

$$(t=4.12) \quad (t=4.06)$$

The R^2 of the regression is 0.33. Beta exerts a positive and significant influence on return. Were the traditional Sharpe-Lintner CAPM correct, the intercept in the above relationship should equal the average risk-free rate during the 1966-1984 period, which was about .06, and the slope coefficient should equal $(R_M - R_f)$ or about .06 also. The actual results, however, point to a flatter relationship than predicted by the pure CAPM, as evidenced by the higher intercept and flatter slope coefficients than predicted. This finding is consistent with expanded versions of the CAPM, including the post-tax version of the CAPM, and is typical of a myriad of research findings in the finance literature.

As Figure 3 demonstrates, the observed relationship between return and beta can be closely approximated by the following equation:

$$K + R_F + 0.3\ (R_M - R_F) + 0.7\ BETA\ (R_M - R_F) \qquad (11)$$

This was derived by systematically varying the constant "x" in the following equation from 0 to 1 in steps of 0.1 and choosing that value of 'x' which minimized the mean square error between the observed relationship, RETURN = .0829 + .0520 BETA, and the empirical approximation CAPM formula. The value of x which best explained the observed relationship was x = 0.3.

$$K = R_F + x\ (R_M - R_F) + (1-x)\ BETA\ (R_M - R_F) \qquad (12)$$

In Figure 3, the fitted relationship, the traditional CAPM, and the empirical approximation of Equation #4 are shown. The approximation almost coincides closely with the observed relationship.

To estimate an asset's cost of equity with the empirical approximation of the CAPM, the current input data for the asset is substituted in the above equation. For example, using a beta of 0.80 a risk-free rate of 9.1% which is the yield on long-term Treasury bonds as of November 1988, a market return of 14.7%, which is the DCF summation of the dividend yield of 3.2% on the Value Line stock index and the consensus expected long-term growth of 11.5% on Zacks' stock universe, the return predicted by the above equation is 13.92%, without a flotation cost adjustment:

$$K = .095 + 0.3\ (.074) + 0.7\ (.074)(0.80) = .1586 \qquad (13)$$

To test for the joint impact of beta and dividend yield on returns, cross-sectional regression is again employed, using the column data of Exhibit RAMAPPB-4. The following regression is estimated:

$$\text{RETURN} = a_o + a_1\text{BETA} + a_2\text{DIV. YLD.} \qquad (14)$$

The results are reported on the right-hand side of Exhibit RAMAPPB-4. The fitted relationship is given by:

$$\text{RETURN} = 0.0423 + .0787\text{BETA} + 0.3981\text{DIV. YLD.} \qquad (15)$$

$$(t=2.11) \quad (t=4.05) \quad (t=1.78)$$

Both beta and dividend yield exert a positive influence on return, although the influence of dividend yield is marginal. This finding is also consistent with the post-tax version of the CAPM. The positive impact of dividend yield on return is likely to have decreased slightly since the tax reform act of 1986, which has diminished, although not eliminated, the tax advantage of capital gains relative to dividend income.

EMPIRICAL RELATIONSHIP vs CAPM
Risk vs Return

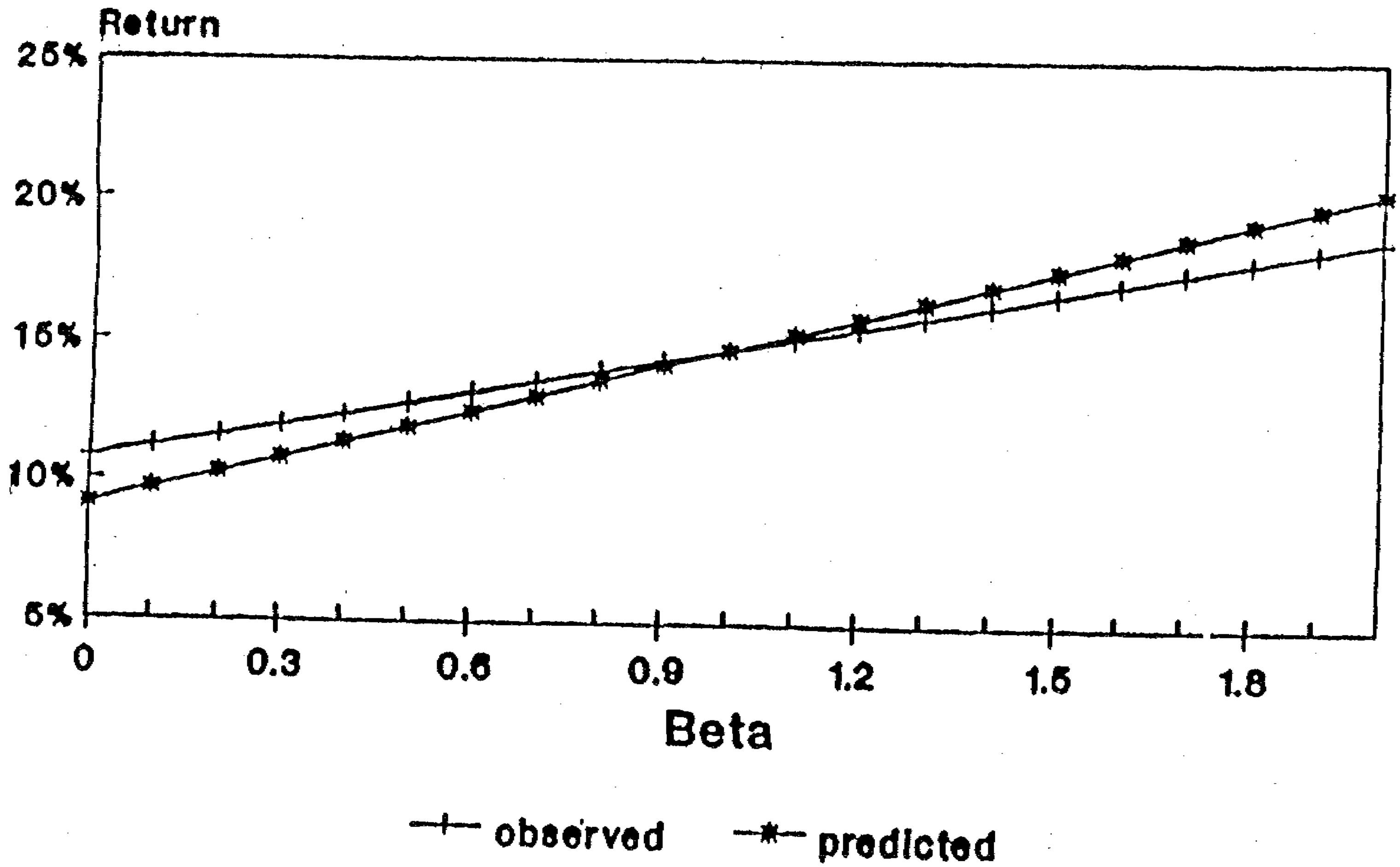

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Figure 1.

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RISK vs RETURN
CAPM vs ECAPM vs OBSERVED

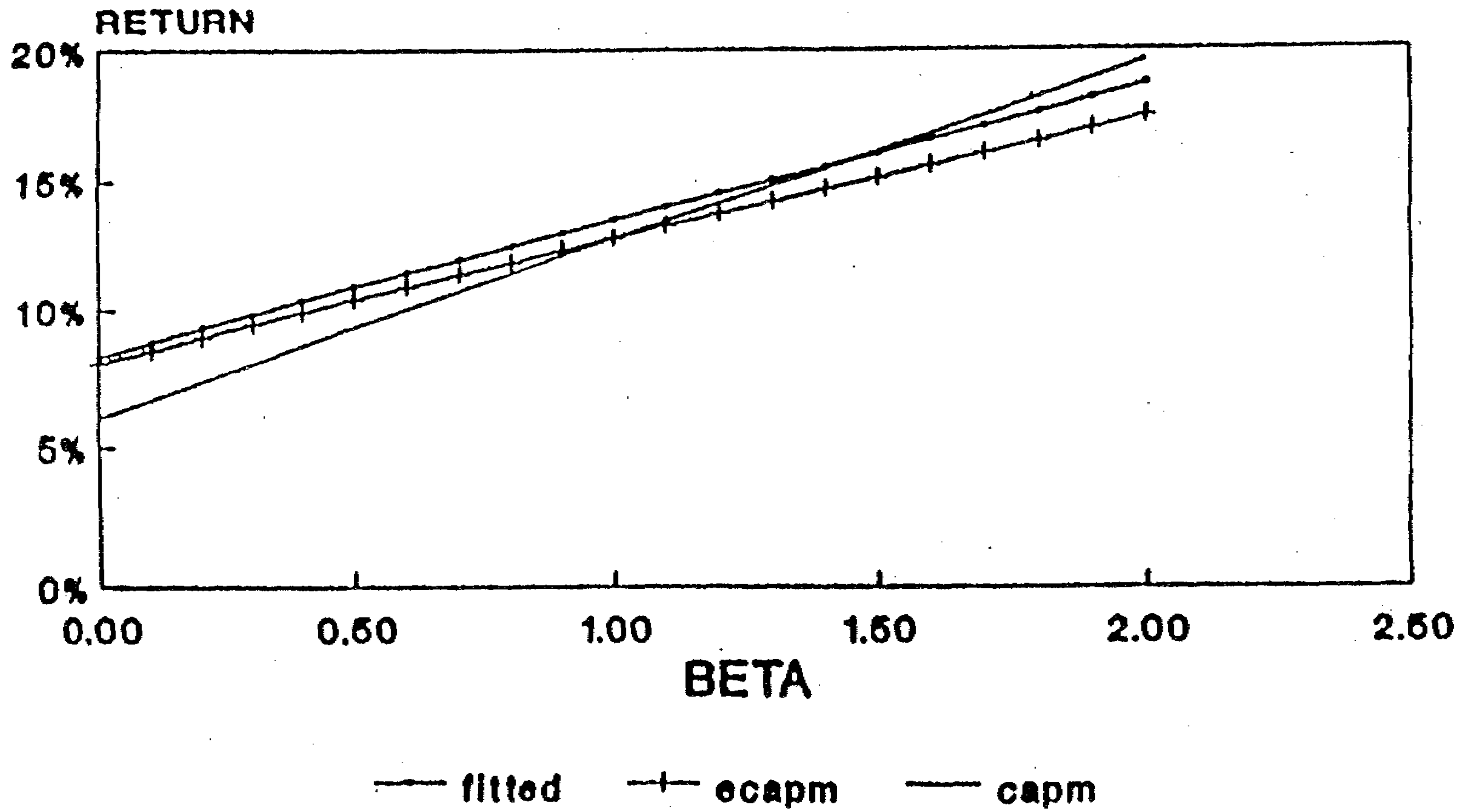

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Figure 2.

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RISK vs RETURN
OBSERVED RELATIONSHIP

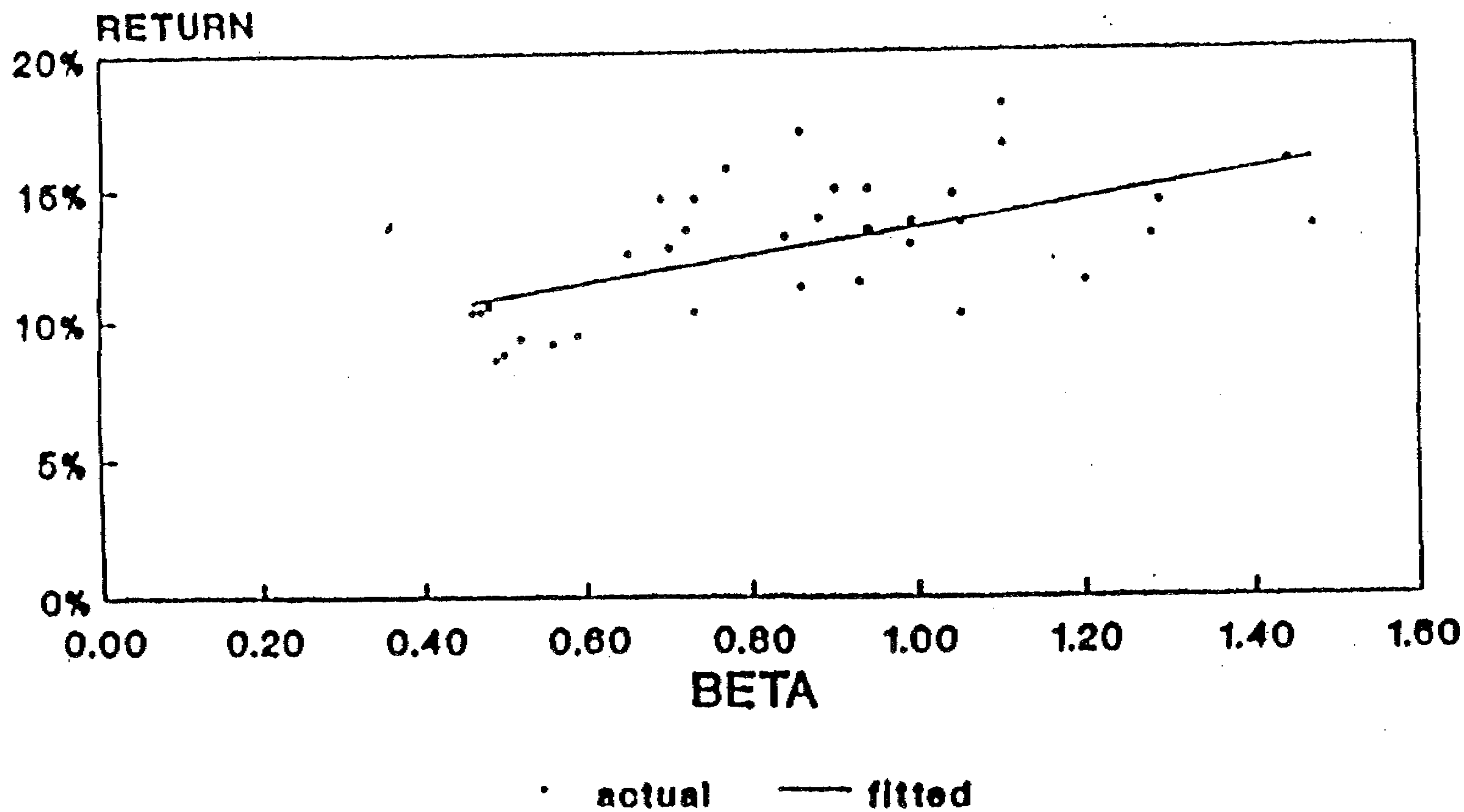

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Figure 3.

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EXHIBIT RAHAPP- 2

STATISTICS: 27 UNREGULATED PORTFOLIOS 1966-84

PORTFOLIO (1)	a (2)	t(a) (3)	b (4)	t(b) (5)	R-SQUARED (6)	DIV YLD (7)	RETURN (8) %
1	0.0010	0.43	0.65	17.32	0.57	0.021	12.50
2	-0.0011	-0.52	0.73	20.38	0.65	0.021	10.30
3	0.0006	0.34	0.84	26.71	0.76	0.021	13.10
4	0.0010	0.76	0.70	32.55	0.82	0.042	12.70
5	0.0120	0.88	0.72	29.95	0.80	0.042	13.40
6	-0.0013	-0.90	0.86	35.45	0.85	0.042	11.20
7	0.0026	2.23	0.69	33.90	0.84	0.064	14.60
8	0.0030	2.33	0.77	35.42	0.85	0.062	15.70
9	0.0024	1.84	0.73	32.98	0.83	0.065	14.60
10	0.0001	0.05	0.94	30.65	0.81	0.018	13.40
11	-0.0007	-0.46	0.99	38.02	0.86	0.019	12.80
12	0.0000	0.00	1.05	35.48	0.85	0.014	13.60
13	0.0016	1.24	0.90	40.99	0.88	0.040	14.90
14	-0.0015	-1.03	0.93	38.68	0.87	0.041	11.40
15	0.0003	0.26	0.99	43.97	0.90	0.040	13.70
16	0.0035	2.90	0.86	41.36	0.88	0.060	17.00
17	0.0008	0.59	0.88	40.25	0.88	0.060	13.80
18	0.0014	1.03	0.94	41.84	0.89	0.061	14.90
19	-0.0009	-0.42	1.29	36.55	0.86	0.003	14.40
20	-0.0009	-0.44	1.44	39.77	0.88	0.030	15.90
21	-0.0026	-1.12	1.47	36.66	0.86	0.020	13.40
22	-0.0031	-2.11	1.05	41.67	0.88	0.025	10.20
23	-0.0028	-1.91	1.20	48.40	0.91	0.025	11.40
24	-0.0020	-1.18	1.28	44.03	0.90	0.025	13.10
25	0.0028	2.04	1.10	46.71	0.91	0.049	18.00
26	0.0006	0.48	1.04	46.11	0.90	0.047	14.70
27	0.0019	1.48	1.10	50.39	0.92	0.048	16.50

EXHIBIT RAMAPP- 2

STATISTICS: 8 REGULATED CO PORTFOLIOS 1966-84

PORTFOLIO (1)	a (2)	t(a) (3)	b (4)	t(b) (5)	R-SQUARED (6)	DIV YLD (7)	RETURN (8)
1	0.0002	0.12	0.48	14.21	0.47	0.068	10.50
2	-0.0015	-0.73	0.49	14.06	0.47	0.069	8.50
3	0.0002	0.09	0.46	12.27	0.40	0.084	10.30
4	-0.0014	-0.63	0.50	13.36	0.44	0.085	8.70
5	-0.0013	-0.57	0.56	13.95	0.46	0.057	9.10
6	-0.0013	-0.55	0.59	14.59	0.49	0.056	9.40
7	0.0002	0.08	0.47	12.54	0.41	0.082	10.30
8	-0.0010	-0.43	0.52	13.37	0.44	0.083	9.30

EXHIBIT RAMAPP- 3

POOLED PORTFOLIO DATA

RETURN, BETA, AND DIVIDEND YIELD

Portfolio	Return	Beta	Dividend Yield
1	10.50%	0.48	6.80%
2	8.50%	0.49	6.90%
3	10.30%	0.46	8.40%
4	8.70%	0.50	8.50%
5	9.10%	0.56	5.70%
6	9.40%	0.59	5.60%
7	10.30%	0.47	8.20%
8	9.30%	0.52	8.30%
9	12.50%	0.65	2.10%
10	10.30%	0.73	2.10%
11	13.10%	0.84	2.10%
12	12.70%	0.70	4.20%
13	13.40%	0.72	4.20%
14	11.20%	0.86	4.20%
15	14.60%	0.69	6.40%
16	15.70%	0.77	6.20%
17	14.60%	0.73	6.50%
18	13.40%	0.94	1.80%
19	12.80%	0.99	1.90%
20	13.60%	1.05	1.40%
21	14.90%	0.90	4.00%
22	11.40%	0.93	4.10%
23	13.70%	0.99	4.00%
24	17.00%	0.86	6.00%
25	13.80%	0.88	6.00%
26	14.90%	0.94	6.10%
27	14.40%	1.29	0.30%
28	15.90%	1.44	0.30%
29	13.40%	1.47	0.20%
30	10.20%	1.05	2.50%
31	11.40%	1.20	2.50%
32	13.10%	1.28	2.50%
33	18.00%	1.10	4.90%
34	14.70%	1.04	4.70%
35	16.50%	1.10	4.80%

EXHIBIT RAMAPP- 4

REGRESSION RESULTS: RETURN, BETA, DIVIDEND YIELD

RETURN & BETA

Regression Output:

Constant	0.082915
Std Err of Y Est	0.020661
R Squared	0.334653
No. of Observations	35
Degrees of Freedom	33
X Coefficient(s)	0.052001
Std. Err of Coef.	0.012763

RETURN & BETA & DIVIDEND YIELD

Regression Output:

Constant		0.042293
Std Err of Y Est		0.020012
R Squared		0.394712
No. of Observations		35
Degrees of Freedom		32
X Coefficient(s)	0.078717	0.398100
Std. Err of Coef.	0.019432	0.223412