CHAPTER VI

TOWARD A POSITIVE THEORY OF EQUITY VALUATION: A CONCLUDING SUMMARY

Current equity valuation models attempt to explain share prices on the basis of measures of underlying firm asset values and real earning power. Historical firm financial statistics are used as surrogates for expectational variables. We have seen in the previous chapters that the firm valuation models surveyed had serious statistical shortcomings. In Section 6.1 we examine an "investor oriented" valuation model to see if the statistical behavior of this model is any better than the previously examined firm oriented models. Section 6.2 contains a few concluding remarks on this methodological study of equity valuation models.

6.1 An Investor Oriented Model of Equity Valuation

The equity valuation models reviewed in previous chapters assume that equilibrium share prices are a function of firm decision processes concerning real financial variables. Such an approach is reasonable only if investor expectations are formed from examining firm financial variables. But it is likely that expectations are based partly on externalities that are not reflected in firm financial statistics. These externalities could include interaction effects among firms in the same industry,[1] changes in the equilibrium level of yields in other

[1]Investors ordinarily think of capital expenditures as a measure of growth and improving efficiency, but there is some indication in the steel and aluminum industries that such expenditures have led to increased competition and reduced profits.

financial markets,[2] new demand-supply forces in the equity markets,[3] or speculative runs with no real economic basis.[4] There are obviously a large number of informational bits that could influence investor expectations in the short run, but hopefully the impact of most such bits produces random deviations about longer run equilibrium levels.

In an effort to bypass some of the measurement problems associated with models restricted to firm financial variables a simple investor oriented model was tested. The model tested is essentially the yield model suggested by equation (2.17). This equation was:

$$(6.1) \quad k^{*} = \frac{E(dv)(\phi_1)}{P_o} + \frac{E(cg)(\phi_2)}{P_o}$$

where k^{*} is the pure rate of interest, E is the expectation operator, (cg) is capital gains, and ϕ is a risk index.

The equation can be rewritten as:

$$(6.2) \quad P = \frac{(\phi_1)E(dv)}{k^{*}} + \frac{(\phi_2)E(cg)}{k^{*}}$$

---

[2]No one doubts that there is some relationship between yields in the stock markets and yields in other financial markets. The exact form of the relationship has never been specified, and we have only the crudest notions about the flow of funds among the various financial markets.

[3]Market professionals argue that the growth of mutual funds, for example, has had a very real impact on both the amount of money coming into the stock market and the way this money is distributed.

[4]It is possible for the majority of people who own a stock to have their wealth substantially increased or decreased without their ever trading in the stock or changing their expectations about the firm. Substantial shifts in wealth can also occur when speculators view each other as opponents in a bidding game that has little relation to the value of the underlying firm assets.

This is essentially an equilibrium certainty equivalent yield model based on a limited time horizon. The expected capital gains results from an aggregation of several underlying causative factors, including (1) growth in dividend, (2) externality conditions as described above, and (3) investor time horizons. Thus the model assumes that investors buy and sell until prices are adjusted to reflect a certainty equivalent dividends gain and a future asset value gain. Dividends are a discretionary management variable determined by firm financial flows. Capital gains, on the other hand, are postulated to be a function both of firm economic activity and of market dynamics (externalities) over which the firm has little control. Thus to the extent expected capital gains can be accurately measured, this model should implicitly incorporate information excluded from models based solely on historical firm financial statistics.

For the initial tests of this model the risk indices (ϕ_1) and (ϕ_2) were assumed to be constant across firms. This may be a reasonable approximation with regard to dividends risk. It is not likely to be a reasonable assumption with regard to capital gains risk, but as we shall see alternative assumptions led to poorer statistical performance. Under the constant risk assumptions the model can be restated as:

(6.3) $P = a \cdot E(dv) + b \cdot E(cg)$

The measures used for expected values for the independent variables were:

(6.3.1) $E(dv)$ = the greater of (dv) or 40¢

(6.3.2) $E(cg)$ = the greater of (ΔP^*) or \$2.00

$$\Delta P^* = \sum_{-4}^{0} W(t)\,[P(t) - P(t-1)]$$

$$W(t) = H \cdot B(1-B)^t$$

$$H = 1/[B \cdot \sum_{-4}^{0} (1-B)^t]$$

$$B = .40$$

all variables are adjusted for stock splits.

Thus expected dividends are the greater of current dividends or an arbitrary 10¢ per quarter. Expected capital gains are essentially the greater of $2.00 or an exponantially smoothed series of actual capital gains for the last five years using weights suggested by Kolin for his earnings variable.[5]

The arbitrary minimum weights could undoubtedly be improved by testing a variety of different combinations if one were a serious advocate of this model. As it is, the results were not sensitive to the 40¢ minimum since only six firms were affected and this is a linear model. The results are more sensitive to the $2.00 minimum (which is about two standard deviations below the average capital gain) since there were several cases where even the weighted gains were negative. The basic assumption is that even in the face of declining stock prices, people do not expect stock prices to continue dropping on a year to year basis. Average values for the sample dividends, capital gains, and prices during the period under study are indicated in Table VI-1.

The results of tests on equation (6.3) are reported in Tables VI-2 and VI-3. Table VI-2 reports the pooled regression estimates while the results for the underlying basic regressions are reported in Table VI-3. The parameter estimates are quite impressive in comparison to the results reported for the models in previous chapters. All coefficients for all

---

[5]See Marshall Kolin, "The Relative Price of Corporate Equity with Particular Attention to Investor Valuation of Retained Earnings and Dividends," Ph.D. thesis, University of Chicago (1965).

TABLE VI-1

MEAN VALUES FOR INDICATED VARIABLES

		1956	1957	1958	1959
	dv	1.73	1.79	1.85	1.96
I	ΔP*	3.03	2.79	6.78	6.58
	P	31.07	30.96	42.83	47.01
	dv	1.93	1.92	1.59	1.64
II	ΔP*	6.34	4.66	7.65	7.57
	P	39.19	27.20	38.56	43.72
	dv	1.60	1.69	1.64	1.76
III	ΔP*	6.64	5.30	9.60	9.49
	P	46.22	41.32	56.31	63.25
	dv	1.95	1.96	1.91	2.03
IV	ΔP*	6.72	5.19	10.41	10.57
	P	47.39	41.03	58.01	67.10

regressions are highly significant. Both variables are important contributors in this model. The beta coefficients and partial correlation coefficients suggest that both variables contribute almost equally to the over-all explanatory power of the model.

The parameter estimates for the large sample size pooled regressions are obviously more stable than parameter estimates for other models. The cross-section pooled samples for the years (1956-1959) exhibit particular stability, with a dividend coefficient of about 11.0 and a capital gains coefficient of 3.8. This is less true when the samples are pooled by group across years, but even here the apparent variation is less than in most of the other models. Given this stability across the pooled regressions can the estimated basic regression coefficients reported in Table VI-3 be regarded as coming from broader populations of stocks? Alas, the

TABLE VI-2

POOLED ESTIMATES FOR THE INVESTOR MODEL

$$P = a(dv) + b(\Delta P^*)$$

	ALL	I	II	III	IV
a	10.876 (.269)	13.661 (.332)	8.932 (.474)	14.812 (.756)	11.049 (.497)
b	3.834 (.061)	2.862 (.121)	3.143 (.123)	3.600 (.150)	4.067 (.090)
R^2	.887	.939	.779	.911	.926
F	3481.5	1697.2	435.2	1014.4	1369.2
		1956	1957	1958	1959
a		11.658 (.439)	10.180 (.637)	11.203 (.589)	11.313 (.573)
b		3.513 (.126)	3.876 (.245)	3.536 (.108)	4.089 (.105)
R^2		.887	.765	.898	.920
F		870.2	360.1	978.3	1265.5

all values significant at 5% level

answer is no. The F ratios in Table VI-4 are all highly significant. The ratios by groups (across years) are noticeably smaller than the ratios by years (across groups), but all these F ratios are of the same magnitude as the ratios reported for the previous models.[6]

[6] These results may indicate one of the limitations of the covariance tests. The ratios are significant despite the fact there is less absolute variation in parameters than in analogous parameters of other models because the standard deviations of the estimated parameters have declined sharply as model performance improved.

TABLE VI-3

REGRESSION ESTIMATES FOR THE INVESTOR MODEL

$$P = a(dv) + b(\Delta P^{*})$$

		1956	1957	1958	1959
I	a	13.592 (.782)	14.681 (.759)	14.788 (.866)	13.630 (.720)
	b	2.645 (.501)	1.897 (.543)	2.383 (.248)	3.122 (.207)
	R^2	.911	.916	.942	.956
	F	277.1	295.9	435.7	592.4
II	a	10.298 (.654)	8.082 (.937)	7.139 (1.431)	12.997 (.990)
	b	2.947 (.186)	2.386 (.371)	3.462 (.305)	2.781 (.202)
	R^2	.870	.669	.806	.804
	F	204.3	60.1	127.3	125.8
III	a	13.906 (1.804)	12.423 (1.942)	17.737 (1.798)	16.624 (1.406)
	b	3.620 (.416)	4.075 (.628)	2.944 (.303)	3.661 (.231)
	R^2	.905	.866	.903	.939
	F	233.0	158.4	229.8	374.8
IV	a	11.756 (.722)	10.119 (1.086)	11.595 (1.031)	10.489 (1.078)
	b	3.730 (.179)	4.579 (.355)	3.659 (.147)	4.456 (.159)
	R^2	.929	.844	.937	.949
	F	357.3	146.0	399.6	508.0

*all values significant at 5% level

TABLE VI-4

COVARIANCE TESTS ON INVESTOR REGRESSIONS

Test	F Ratios
ALL	236.4
I	7.5
II	36.9
III	8.9
IV	13.0
1956	38.7
1957	73.8
1958	40.9
1959	47.0

all results significant at 5% level

There are other problems that remain with the Investor model. The firm effects, as indicated by the signs of the residuals,[7] are as strong as ever. While the Chi-squared tests on residual signs suggest there are also some industry effects, these effects do not seem to be as strong as they were in the other models.[8] There is also a definite reduction in the extreme variability of the residuals. In the sixteen basic regressions for the Investor model none of the firm residuals were more than four standard deviations from the mean of the residuals and only twelve were greater than three standard deviations. This is an improvement over the other models and undoubtedly contributed to the increased sharpness of the parameter estimates.

---

[7]See Section 4.3 for a discussion of firm effects tests.

[8]See Section 4.4 for a discussion of industry effects.

One can infer from the lower values for the estimated capital gains coefficient relative to the dividends coefficient that there is greater risk associated with expected capital gains yield than with expected dividend yield as defined. Several attempts were made to find risk indexes to improve the stability of the Investor model. In general, these indexes increased the estimated capital gains coefficient as expected, but the risk indexes surveyed also decreased apparent parameter stability and decreased the over-all explanatory power of the model.

Results for two of the more interesting risk indexes are reported in Table VI-5. The two variations reported there result from the following model specification:

$$(6.4) \quad P = a(dv) + \frac{b(\Delta P^{*})}{\phi_2}$$

<u>Variation (1)</u>

$\phi_2 = \sigma_i/\sigma_s$

<u>Variation (2)</u>

$\phi_2 = [1 + \mu_{is}(\sigma_i/\sigma_s)(\mu'_s - \rho)/\rho]$

σ_i = standard deviation of rate of return (capital gains and dividends) on security (i); computed from yearly rate of return figures for 1950-1959.

σ_s = standard deviation of rate of return on Standard and Poor Index for 1950-1959.

μ'_s = average of Standard and Poor Index rates of return for 1950-1959.

ρ = .04

μ_{is} = correlation between rate of return on security (i) and rate of return on Standard and Poor Index for 1950-1959.

The first variation assumes that risk is associated with firm return variability relative to return variability for a market average. The

TABLE VI-5

VARIATIONS IN THE INVESTOR MODEL

			1956	1957	1958	1959
(1)	I	a	12.680	14.270	12.505	13.099
		b	3.723	2.533	3.704	3.925
		R^2	.885	.912	.893	.905
	II	a	6.521	5.820	7.092	11.459
		b	9.093	7.535	7.642	6.900
		R^2	.790	.675	.725	.631
	III	a	13.692	8.029	16.550	15.528
		b	6.314	9.861	5.689	6.927
		R^2	.899	.894	.874	.903
	IV	a	7.812	4.712	-2.122+	-2.005+
		b	8.929	12.424	11.573	12.372
		R^2	.826	.781	.872	.812
(2)	I	a	13.293	14.281	15.988	16.058
		b	5.666	4.225	3.847	4.281
		R^2	.905	.934	.921	.904
	II	a	15.339	12.001	17.312	17.763
		b	4.717	2.435	4.575	6.539
		R^2	.627	.489	.500	.490
	III	a	23.490	20.268	27.067	27.853
		b	3.670	3.478	2.954	3.349
		R^2	.819	.818	.847	.858
	IV	a	14.573	12.269	15.182	15.158
		b	8.572	10.464	7.432	8.484
		R^2	.850	.852	.850	.816

all values except (+) significant at 5% level
for a description of variations (1), (2) see
equation (6.4).

second index is one form of Sharpe's risk index derived from the correlation between firm yield and some efficient portfolio yield.[9] We can see from the discussion in Section 2.3.1 that Sharpe's index is essentially a regression coefficient of the return on an individual security as a function of the return on an efficient portfolio. This measure he calls the systematic risk component and is proportional to the slope between returns on security (i) and the efficient portfolio. As was true of risk indexes for all other models studied, apparent parameter stability was decreased by inclusion of the index while firm effects were not reduced at all.

Thus the Investor model, incorporating an explicit market variable, is only a modest improvement over the models concentrating on firm financial variables.[10] The facts are that in all models tested residual firm effects remain powerful and pervasive. An obvious conclusion might be that nearly every firm is unique--representative of a population of only one or a few. Even under a binary ranking criterion it would only take twelve variables to have more potential combinations of variable states than there are stocks on the New York Stock Exchange. Under the more typical ternary ranking procedures employed by most market analysts

---

[9] See William Sharpe, "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk," Journal of Finance, 19 (September, 1964), pp. 436-442. The test assumes, of course, that the securities in the Standard and Poor Industrial Index make up an efficient portfolio. This may not be a reasonable assumption and warrants further study.

[10] Although the investor model has some intriguing properties, it should not be taken too seriously. The intention was to show that it is not too difficult to develop a model that will perform at least as well as other existing models surveyed. This does not mean that we have now found a particularly satisfactory model of equity valuation.

(below average, average, above average) only seven variables would create more potential combinations than stocks.

To suggest an equity valuation process based on a large number of independent cells, where the parameter values for the decision variables within each cell may be unique to that cell, is to deny the appropriateness of the basic behavioral propositions underlying all the models surveyed. Such an assertion is equivalent to asking the question, "Are equity share prices determined by return-risk considerations that can be effectively summarized by a linear or log-linear model with single-valued parameters?" If the answer is "no" then our simplistic notions of portfolio selection and equilibrating processes in the equity markets must be considerably refined.

6.2 A Concluding Summary

In recent years there has been a rapidly expanding effort by academic and business institutions to develop explanatory models of equity valuation. The principal approach taken by these researchers has been to postulate theories centered around firm economic activity and then to test these theories by specifying single equation regression models using historical firm financial data.

Five of the more widely known explanatory models of equity valuation are formulations proposed by Durand, Modigliani-Miller, Barges, Benishay, and Gordon. In this study these models have been investigated in some detail on both their individual merits and comparative differences in an effort to ascertain their ability to meet reasonable statistical tests of significance.

These are the principal findings:

(1) The models seem to start from the same general assertions about investor objectives--namely that investors are interested in selecting a portfolio using risk-return criteria. There is general agreement that return is expected yield as measured by dividends or earnings flows relative to invested capital plus expected capital gains return. There is less agreement on an appropriate definition for risk, which is commonly associated with the variability of return.

(2) Despite the common basis of underlying assumptions, the theoretical specification of the different models varied considerably in variable emphasis. The models were formulated in such a fashion that in their empirical specifications they could be tested by single equation regressions to answer particular questions about firm financial decisions. However, an examination of the assumptions utilized seemed to indicate that if the theoretical framework were carried through to its logical conclusion (particularly with a finite time horizon) the resulting general model would probably be one that could not be tested in a simple manner by linear or log-linear regressions.

(3) The models were tested for four samples for the four years 1956-1959. The samples included both industry-type groups and a multi-industry group; the four years selected include different years in a significant stock market cycle. The sixteen basic regressions and subsequent pooled regressions

for each model provide far more extensive results than have heretofore been available.

(4) In general, the great majority of the estimated parameters for the variables of the models were neither statistically significant nor stable from sample to sample. About all one can conclude from the results is that there is usually a positive relationship of unspecified magnitude between equity share prices and dividends, earnings, and growth rates. The performance of all risk-type variables was particularly poor as parameter estimates for these variables were highly unstable and addition of these variables often reduced the over-all explanatory power (adjusted R^2) of the model. These results on parameter estimates seem rather meager in view of the large expenditure of time and money that has been spent on equity valuation models in the past decade and in view of the fact that the indicated results are apparent to almost any amateur looking at the equity markets.

(5) The residuals of all models tested seemed to violate assumptions ordinarily made in standard regression theory. In many cases the residuals were not independent within a given sample. There was even stronger dependence in residuals across samples; what Kuh has characterized as "firm effects" were present in every model tested. Estimated sampling variances were not constant across groups for the same year, but were usually constant across years for the same group, suggesting there were significant group or "risk class" differences not captured by any

of the models. Finally, there is some doubt the residuals are normally distributed. In particular, there seemed to be too many extreme values in the residuals, a situation which undoubtedly contributed to the instability of the parameter estimates.

(6) In view of the almost complete failure of current single equation equity valuation models, it would seem useful to look at a more complex framework for the development of future models. Equity share prices seem to be determined both by firm economic activity and by external influences over which the firm has no control, but which may not affect all firms equally. Under such circumstances it may be that the complex behavioral dynamics involved in the equity valuation process are better modeled by general programming models[11] or multi-equation behavioral models[12] or a combination of both.

The search for the fountain of youth and the way to transmute base metals to gold was never very successful. Nevertheless, the fallout findings from these efforts were considerable. Perhaps this is the most that will result from the current expanding efforts to find a key to the understanding of the determinants of equity share prices.

---

[11] See the following for sketches of such models: Markowitz, Portfolio Selection, Nasland and Whinston, op. cit., and Weingartner, op. cit.

[12] Gordon has certain elements of such a system in the way he defines current dividends. See Gordon, The Investment, Financing, and Valuation of the Corporation, pg. 157. See also the recent explicit attempt to develop such a model by Lerner and Carlton, "Capital Budgeting and Stock Valuation."