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Three Factors, Interest Rate Differentials and Stock Groups: Discussion

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DISCUSSION

IRWIN FRIEND:* Profs. Fogler, John and Tipton (F-J-T) state that the purpose of their paper is "to assign economic meaning to stock market factors and to determine the extent to which these factors were related to the prices of capital in the bond market." They conclude "For the most part, we feel that our analysis has achieved these goals." It is not clear to me that the two goals mentioned have been achieved.

F-J-T hypothesize that three factors explaining market returns on individual common stocks are or can be measured by the returns on the stock market as a whole, on a 3-month Treasury obligation and on a long-term AA-Utility bond, with the last two factors specifically representing interest-rate and default risks. Their initial analysis consists of regressing excess returns for each of a sample of stocks on excess returns for each of the three factors. Their tentative conclusion from this part of their analysis is that while only the stock market return factor is generally significant, the sample regressions suggest that the classification of stocks into "growth", "stable" and "cyclical groups" "may be related to their relative sensitivity to bond market returns for interest rate risk and default risk."

The relevant data presented in Table 1, however, do not provide any indication that interest rate risk as measured by the 3-month rate significantly affects relative stock returns. Of the 100 stocks in the sample of companies covered, the 3-month rate had a significant effect on only one company at the .01 level of significance, on 7 companies at the .05 level and 5 more at the .10 level, numbers which do not appear to differ significantly from chance results. Nor does there seem to be much justification to the F-J-T statement that the more generally negative effect of the 3-month rate of returns of "growth" stocks as well as similar results for the AA rate "would suggest that investors may expect growth companies to be stronger financially and therefore able to survive relatively better than other companies during times of economic stress." The generally negative effect of the 3-month rate in "growth" stocks (10 out of 15 companies) seems very little different from that for "cyclical" stocks (20 out of 28 companies) while for "stable" stocks which might be expected to fare much better than "cyclical"

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stocks in depressed periods the evidence points to a more positive effect (7 out of 13 companies). Thus in this initial analysis there is little evidence that the 3-month rate adds any meaningful explanatory power to the usual CAPM explanation of relative returns on risky assets.

On the other hand, the statistical results that F-J-T present in Table 1 suggest that AA returns are more useful in explaining individual stock excess returns. The problem which remains with the more respectable statistical results provided by the AA rate variable is what economic interpretation to give them. F-J-T do not make clear why and how they apparently expect the excess rate of return on stock to be negatively related to the excess AA return but they seem to feel that the latter in their regressions is largely a proxy for return associated with general default risk and that certain stocks (the "cyclical" group in particular) are much more unfavorably impacted by general default risk than other stocks (the "growth" and "stable" groups). While they do not make the point, they presumably are assuming that the realized excess returns they measure for the AA index are an adequate proxy for required excess return. It would appear that change in the excess return on high-grade corporate bonds are fully as likely (in my opinion more likely) to reflect changes in excess returns on long-term default free instruments as on bonds subject to default risk. While there are several different rigorous theoretical developments of models in the literature explaining the expected relationship between excess returns on individual assets and both on the market as a whole and on long-term default-free interest rates or between excess returns on individual assets and both on the market cash flow and on the market capitalization rates, I do not know of nor have F-J-T presented such a model incorporating default risk.

The second analysis carried out by F-J-T is an attempt to provide economic content to Ross' arbitrage pricing theory by deriving principal components for the 100 stock returns studied in the initial analysis and testing whether these components can be shown to be linear combination of the three economic factors assumed earlier to explain returns on individual stocks. My own interpretation of their results presented in Table 4 is quite different from their conclusion that the table "documents the role of interest rate variables as important causes of the differential movements of stock price groups." Only one factor, return on the market as a whole, has a clearly statistically significant effect in explaining variance in linear combinations of the first three or four principal components and provides consistent estimates of the relevant regression coefficients from period to period.

In their initial tests covering three broad sub-periods in the entire 1959-77 period studied, only for one sub-period does the F-J-T analysis point to significance at as much as a .1 level for either of the two interest rate variables, and their estimated effects in explaining variance in linear combinations of the principal components in this period are opposite in sign. In the other two periods, one interest rate variable, i.e., the 3 month Treasury, shows "significance" at the .12 or .13 level but the estimated effects for this variable are opposite in sign as between the two periods. When F-J-T break out three smaller periods for further analysis, the estimated effects of the AA rate variable show more statistical significance, but of the two periods in which this effect is significant at the .1 or

higher level, the sign of the effect is reversed in one of these periods when four instead of three principal components are used. Without some further explanation of these results, it is difficult to tell whether they are economically meaningful or simply represent the results of conscientious curve-fitting.

Having raised some questions about the F-J-T analysis, I should add that I agree with the need to assign economic meaning to stock market factors. I have serious reservations about the potential usefulness of arbitrage pricing theory which assumes that investors agree on the relative importance of each of a number of undefined factors in determining the required returns on each of a much larger number of individual assets. Without a specific delineation of what these factors are, it seems to me that there is only one way in which the empirical implementation of arbitrage pricing theory might be useful. If an undefined set of factors could somehow be projected to predict relative asset returns in the future, this would be useful for some purposes even if not altogether theoretically satisfying, but in any case this has not been done and I have some doubts that it can be done. It seems doubtful that the unidentified factors would remain identical in order of importance from period to period as would appear to be necessary for predictive purposes. It is more likely that some of the factors found *ex post* to be critical in one period (e.g., associated with severe oil shortages, war scares, etc.) will be unimportant in the following period. Moreover, in the absence of an explicit description of the factors so that they can be used for attempted predictive purposes, there seems to me to be the danger that statistically estimated factors may represent statistical artifacts resulting perhaps from our inability to specify rigorous significance tests.

DISCUSSION

M. J. BRENNAN*: Professors Oldfield and Rogalski present a test of the Arbitrage Pricing Model based on an *a priori* specification of the relevant factors. No evidence is offered that these factors, which are based on factors drawn from T-Bill returns, are the only, or the most important, of the common factors influencing common stock returns. Indeed no motivation is offered as to why T-Bill returns and common stock returns should be correlated, although they appear to be so in fact.

It seems unlikely to say the least that their factor specification should be complete, and the effect of omitting factors will be to bias in an unknown manner the coefficients of the cross section regressions. Therefore their finding that the estimate of the risk free rate yielded by the cross section regression is significantly different from the actual riskless rate may be interpreted as a rejection of the APT, and evidence for the existence of arbitrage opportunities—on the other hand, it may be attributed to the influence of the omitted factor loadings in the cross section regressions. Similar considerations apply to the significant constant term found in the cross section regressions when the return on the market portfolio is included as an additional factor.

I do not know quite what to make of the more favourable results obtained from a zero beta specification of the APT. Surely if the zero beta portfolio has a return

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