ON THE RISK RETURN CHARACTERISTICS OF THOSE FIRMS EXPERIENCING THE HIGHEST FREE CASH FLOW YIELDS

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ABSTRACT

Normally, all investors buy or sell equities according to their perception of the intrinsic value of firms and the securities those firms issue. Thus, a normative goal for both individual and institutional investors is, or should be, to determine as closely as possible, the intrinsic value of firms that are being contemplated for purchase or sale. Most analysts would agree that a determination of that value must involve an analysis of the free flow of cash. However, in practice, investors, analysts, and financial managers traditionally use, among other data, ratios of valuation to aid in determining the value of firms that may be potentially good investments. If those traditional tools have a common fault, it is that they value a company at one point in time, and their reliability may be questioned when comparing companies with different capital structures, or in different industries. Moreover, those classic tools do not consider free cash flows. There is, of course, a great deal of difference between income and free cash flows, and every firm must ultimately produce those free cash flows. Thus, the free cash flow yield as a tool to measure value has grown in use. The free cash flow yield is concerned first, with cash, and has the advantage of measuring the value of the firm as an on-going entity, and the ability to compare companies with different capital structures that is lacking in the more traditional ratios. The purpose of this study is to create a financial risk-return profile of those firms with the highest free cash flow yields, to compare that profile with companies selected at random, and to rank those factors that influence the free cash flow yield. As in previous studies of this nature, those factors are analyzed using multiple discriminant analysis, and ranked with canonical correlation. **JEL Classification**: G11

INTRODUCTION

In efficient markets all securities are traded at or close to their intrinsic value, depending on just how efficient the market is. There exists many tools, including financial valuation ratios, that are used by investors, financial managers, and acquiring firms to estimate the intrinsic value of firms. Some of the more familiar valuation ratios are the price earnings multiple, the market value to book value ratio, Tobin's Q, and the price earnings growth ratio. If those tools have a common fault, it is that they value a company at one point in time, and their reliability may be questioned when comparing companies with different capital structures, or in different industries. Although the price earnings multiple appears to continue to be the most popular tool used by investors and others for valuation, the free cash flow yield (FCFY) has for the past three decades grown in use more extensively. Wagner (2009) offered the opinion that since the FCFY uses free cash flow, instead of earnings that it provides a better measure of a company's performance. Wagner concluded that the significance of the FCFY lies in its ability to compare companies with different capital structures and in different industries on an on-going basis, and that by using the FCFY instead of market price and earnings to look at the value of a company, investors get a more accurate sense of whether or not a company is truly valued Wagner (2009). Further, Reese (2013) found that a growing number of investors regard free cash flow as a more accurate representation of a company's value and thus prefer free cash flow yield as a valuation metric over earnings yield since having free cash flow allows a company to build shareholder wealth by buying back stock, increasing dividends, paying off debt, or making acquisitions.

The free cash flow yield is defined here as:

Free Cash Flow Yield = Free Cash Flow to the Firm / Enterprise Value (1)

Where:

Free Cash Flow to the Firm = EBITDA – Capital Expenditures – Interest (1– t) – Principal Payments – Change in Working Capital - Taxes (2)

Enterprise Value = Market Capitalization + Debt + Preferred Stock + Minority Interest - Cash and cash equivalents. (3)

EBITDA = Earnings Before Interest, Taxes, Depreciation and Amortization. (4)

Another way to compute the FCFY is to use market capitalization as the denominator in equation (1) above. That method is closely related to the price earnings multiple. Many investors use both methods. However, as stated above the use of enterprise value in the denominator has the advantage of comparing companies as on-going concerns, and across different capital structures. Thus, the method defined in equation (1) is used in this study. If EBITDA is relatively stable, it allows acquirers or other buyers to evaluate a company on an on-going basis. That characteristic is lacking in the more traditional ratios. Regardless of the growing interest and apparent advantages of using the FCFY to the estimate intrinsic value of firms, there have been no studies that have determined, or established an association, between the effects of traditional measures of risk and return on the free cash flow yield.

The purpose of this study is to establish a financial profile of those firms identified as having the highest free cash flow yields in the database of over 5000 firms created by (Damodaran 2014) from Bloomberg, Morningstar and Compustat. Specifically, the analysis will test for significant differences in the financial profiles of firms with the highest free cash flow yields and to compare those profiles with companies selected at random. The financial profiles simply consist of common risk-return variables, and two indicators that may reflect how the market views the intrinsic value of the firm, If the two groups of firms have unique financial profiles, and the model can be validated without bias, it suggests that the unique profile may be used as a tool to forecast companies that will maintain high FCFY in future periods. The use of such a new tool to forecast higher positions of value would have implications for investors, managers, lenders, investment counselors, and academicians.

METHODOLOGY

The issues to be resolved are first, classification or prediction, and then evaluation of the accuracy of that classification. More specifically, can firms be assigned, on the basis of selected financial variables, to one of two groups: (1) firms that were identified as having the highest free cash flow yields in their database simply referred to here as highest free cash flow yields (FCFY) or, firms randomly chosen (FRC)?

Multiple discriminant analysis (MDA) provides a procedure for assigning firms to predetermined groupings based on variables or attributes whose values may depend on the group to which the firm actually belongs, and canonical correlation ranks those variables in order of their weighted effects on the results of the analysis. If the purpose of the study were simply to establish a financial profile of each group of firms, simple ratios would be adequate. However, as early as 1968, in a seminal paper on the use of MDA in finance, Altman showed that sets of variables used in multivariate analysis were better descriptors of the firms, and had more predictive power than individual variables used in univariate tests.

The use of MDA in the social sciences for the purpose of classification is well known. MDA is appropriate when the dependent variables are nominally or ordinally measured and the predictive variables are metrically measured. In addition to its use in the Altman study to predict corporate bankruptcy, other early studies used MDA to predict financially distressed property-liability insurance firms (Trieschmann and Pinches 1973), to determine value (Payne 2010), and the failure of small businesses (Edmister 1982). This study also employs nominally measured dependent variables and metrically measured predictive variables. The nominally measured dependent variables are the group of high FCFY firms and the group of FRC firms. The computer program used to perform the analysis is SPSS 21.0 Discriminant Analysis (SPSS Inc. 2012). Since the objective of the analysis is to determine the discriminating capabilities of the entire set of variables without regard to the impact of individual variables, all variables were entered into the model simultaneously. This method is appropriate since the purpose of the study was not to identify the predictive power of any one variable, but instead the predictive power of the entire set of independent variables (Hair et al. 1992, 99).

SELECTION OF SAMPLE AND INDEPENDENT VARIABLES

Inasmuch as the FCFY has the advantage of measuring the value of the firm as an on-going entity, and the ability to compare companies with different capital structures and in different industries, and further, as previously stated, has for the past three decades grown in use more extensively than of other measures (Reese 2013), it is used here as the subject of study.

All data used in the analysis were gathered from Domodaran's 2014 set. The sample selected for this study consists of two groups. The high FCFY group contains 758 observations and the high FRC group has 569 observations. The sample is large enough that as long as the variance covariance matrices are equal, it renders the size of the groups insignificant, and of course, the use of that much data exhausted Domodaran's database in the FCFY category. The first group was identified by Damodaran as the group in that database having the highest FCFY. The second group was randomly selected from the remaining firms in that database.

Previous studies using this and other statistical methods have chosen explanatory variables by various methods and logical arguments. In this study, the group of explanatory variables chosen for analysis includes two measures of return on investment, three measures of risk, and two measures of how the company may be perceived by investors at the margin (those willing and able to buy). It is the buying and selling of those investors that establish the market value of both equity and debt. An evaluation of those measures is needed to accomplish the purpose of this study. A basic tenet of this study is that all investors "trade off" indicators of risk and return to establish the value of the firms. Following are the seven explanatory variables:

X_1– One measure of return is return to total capital. Return to total capital includes a return to creditors as well as owners, and recognizes that value is affected by the cost of debt. A measure of return to equity could be used, but it would ignore the cost of debt and the fact that debt as well as equity is used to finance assets. This is consistent with the use of the debt to total capital ratio as a measure of financial leverage

X_2 – Growth may also be regarded as a return on capital, and indeed growth has been of interest to financial investors for years, and all investors as well as financial managers value expected growth more than historical growth. In this study, Damodaran's (2014) expected five-year change in earnings per share was used.

X_3– There is in any company both financial risk (financial leverage) and operating risk (operating leverage). Sharpe's beta coefficients contain the effects of both operating and financial risk. It is customary in modern research to separate the two types of risk to identify and compare the sources of risk. The separation is accomplished by using Hamada's (1969) equation to "unlever" the published betas. Damodran (2014) used that equation to unlever the "bottom up" sector betas. Those betas are used here as a measure of operating leverage (operating risk that results from fixed operating costs).

X_4 – Financial leverage (financial risk resulting from fixed finance costs) is measured here by use of the long term debt to total invested capital ratio (DTC). That ratio is used here as a measure of financial leverage. There are other ratios that measure financial risk very well, but the long-term debt to total capital ratio again recognizes that the firm is financed by creditors as well as owners.

X_5 – The fifth explanatory variable is the coefficient of variation in earnings before interest and taxes (EBIT). The coefficient of variation (CV) standardizes the relative variance in EBIT among companies, and allows comparison of those variances in relation to the expected value of EBIT for each company in the dataset. The greater the CV, the greater is the risk in relation to the expected EBIT. Thus, it is included here as a measure of a different type of risk than indicated by the above two leverage ratios.

X_6 – The activity of institutional investors has long been a favored topic in financial literature. The daily trading of such investors varies between 50 and 70 percent of all daily trading on the New York Stock Exchange (Brancato and Rabimov 2007). We include the buying activity of institutional investors simply as an indicator of how the market or at least a significant part of the market regarded those firms.

X_7 – The ratio of market price to earnings (P/E) has been used for years as a rough measure of how the market values a firm. Indeed, the P/E multiple, and dividend yield are the only ratios reported every day on the financial pages of newspapers, and it has been argued that in efficient markets the multiple reflects the intrinsic value of stocks, (Scripto, 1998, Payne Tyler and Daghestani 2013). More recently, the price earnings growth ratio (PEG) has grown in popularity. Damodaran, (2002) writes that the PEG ratio is a better measure of a company's potential future value, and was developed to address the shortcomings of the P/E multiple. He further writes that many analysts have abandoned the P/E ratio, not because of any perceived shortcomings, but simply because they desire more information about a stock's potential. Thus, it is used here as a second indicator of how investors at the margin may perceive a company's potential long term value.

In sum, there are six explanatory variables in the multiple discriminant model.

They are as follows:

X1 - Return on Total Capital
X2 - The Five Expected Year Growth Rate
X3 - The Bottom Up Unlevered Sector Beta (Operating Risk)
X4 - Long Term Debt to Total Capital (Financial Risk)
X5 - The Coefficient of Variation in EBIT
X6 - Institutional Investor Buying Activity
X7 - The Price Earnings Growth (PEG) ratio

The explanatory variable profile contains basic measures of common financial variables. They were chosen, as in any experimental design, because of their consistency with theory, adequacy in measurement, the extent to which they have been used in previous studies, and their availability from a reputable source. Other explanatory variables could have been added, however their contributions to the accomplishment of the stated purpose of the study would have been negligible. When there are a large number of potential independent variables that can be used, the general approach is to use the fewest number of explanatory variables that accounts for a sufficiently large portion of the discrimination procedure (Zaiontz 2014). The more accepted practice is to use only the variables that logically contribute the accomplishment of the study's purpose (Suozzo 2001). This study is consistent with both references.

TESTS AND RESULTS

The discriminant function used has the form:

$$Z_j = V_1X_{1j}+V_2X_{2j}+\ldots+V_nX_{nj} \quad (5)$$

Where:

X_{ij} is the firm's value for the ith independent variable.
V_i is the discriminant coefficient for the firm's jith variable.
Z_j is the jth individual's discriminant score.

The function derived from the data in this study and substituted in equation 1 is:

$$Z_j = -1.362 - .528X_1 + 5.124X_2 - 1.448_3 + 2.189X_4 + 20.829X_5 + .609X_6 - .007X7 \quad (6)$$

Classification of firms is relatively simple. The values of the seven variables for each firm are substituted into equation (5). Thus, each firm in both groups receives a Z score. If a firm's Z score is greater than a critical value, the firm is classified in-group one high (FCFY). Conversely, a Z score less than the critical value will place the firm in-group two (FRC). Since the two groups are heterogeneous, the expectation is that FCFY firms will fall into one group and the FRC firms will fall into the other. Interpretation of the results of discriminant analysis is usually accomplished by addressing four basic questions:

1. Is there a significant difference between the mean vectors of explanatory variables for the two groups of firms?
2. How well did the discriminant function perform?
3. How well did the independent variables perform?
4. Will this function discriminate as well on any random sample of firms as it did on the original sample?

To answer the first question, SPSS provides a Wilk's Lamda – Chi Square transformation (Sharma 1996, 252). The calculated value of Chi-Square is 68.73. That far exceeds the critical value of Chi-Square 14.067 at the five percent level of significance with 7 degrees of freedom. The null hypothesis that there is no significant difference between the financial profiles of the two groups is therefore rejected, and the first conclusion drawn from the analysis is that the two groups have significantly different financial characteristics. This result was of course, expected since one group of firms experienced very high free cash flow yields and the other group was chosen randomly. The discriminant function thus has the power to separate the two groups. However, this does not mean that it will in fact separate them. The ultimate value of a discriminant model depends on the results obtained. That is what percentage of firms was classified correctly and is that percentage significant?

To answer the second question a test of proportions is needed. Of the 758 firms in the high FCFY group, 494 were classified correctly. Of the 569 firms in the FRC group, 312 were classified correctly. That is, 806 of the total of 1327 in the total sample or 60.7 percent were classified correctly. The results are shown in Table 1.

To determine whether 60.7 percent is significant formal research requires the proof of a statistical test. To test if a 60.7 percent correct classification rate is statistically significant, the Press's Q test is appropriate (Hair et al. 1992, 106). Press's Q is a Chi-square random variable:

$$\text{Press's Q} = [N-(n \times k)]^2 / N(k-1) \tag{6}$$

where:

N = Total sample size
n = Number of cases correctly classified
k = Number of groups

In this case:

$$\text{Press's Q} = [1327 - (806 \times 2)]^2 / [1327 (2-1)] = 61.21 > \chi^2_{.05}\ 3.84 \text{ with one d. f.} \tag{7}$$

Thus, the null hypothesis that the percentage classified correctly is not significantly different from what would be classified correctly by chance is rejected. The evidence suggests that the discriminant function performed very well in separating the two groups. Again, given the disparity of the two groups, and the sample size, it is not surprising that the function classified 60.7 percent correctly.

The arithmetic signs of the adjusted coefficients in Table 2 are important to answer question number three. Normally, a positive sign indicates that the greater a firm's value for the variable, the more likely it will be in group one, the FCFY group. On the other hand, a negative sign for an adjusted coefficient signifies that the greater a firm's value for that variable, the more likely it will be classified in group two, the FRC group. Thus, according to Table 2, the greater the following variables: The coefficient of variation, the five year expected growth rate, the long term debt to total capital ratio, and institutional buying activity, the more likely the firm would have achieved a high free cash flow yield. Conversely, the greater the return to total capital, the level of operating advantage, and the price earnings growth multiple, the less likely the firm would have achieved a high free cash flow multiple.

The relative contribution of each variable to the total discriminating power of the function is indicated by the discriminant loadings, referred to by SPSS as the pooled within-groups correlations between discriminating variables and canonical function coefficients, or more simply their structure matrix. Those structure correlations are indicated by canonical correlation coefficients that measure the simple correlation between each independent variable and the Z scores calculated by the discriminant function. The value of each canonical coefficient will lie between +1 and -1.

Multicollinearity has little effect on the stability of canonical correlation coefficients, in contrast to the discriminant function coefficients where it can cause the measures to become unstable (Sharma 1996, 254). The closer the absolute value of the loading to 1, the stronger the relationship between the discriminating variable and the discriminant function These discriminant loadings are given in the output of the SPSS 21.0 program, and shown here with their ranking in Table 2.

Table 2 reveals that the risk as measured by the coefficient of variation made the greatest contribution to the overall discriminating function. It is followed respectively by the measure of the five year expected growth rate, the return to total capital, long term debt to total capital (a measure of financial leverage), the unlevered bottom up beta (a measure of operating leverage), the price earnings growth ratio, and finally institutional investors buying activity.

Some multicollinearity may exist between the predictive variables in the discriminant function, since both return and risk could be reflected in the institutional investors buying activity. Hair, et al. (1992) wrote that this consideration becomes critical in stepwise analysis and may be the factor determining whether a variable should be entered into a model. However, when all variables are entered into the model simultaneously, the discriminatory power of the model is a function of the variables evaluated as a set and multicollinearity becomes less important. More importantly, the rankings of explanatory variables in this study were made by the canonical correlation coefficients shown in Table 2. As discussed the previous paragraph, those coefficients are unaffected by multicollinearity (Sharma, 1996).

VALIDATION OF THE MODEL

Before any general conclusions can be drawn, a determination must be made on whether the model will yield valid results for any group of randomly drawn firms. The procedure used here for validation is referred to as the Lachenbruch or, more informally, the "jackknife" method. In this method, the discriminant function is fitted to repeatedly drawn samples of the original sample. The procedure estimates (k – 1) samples, and eliminates one case at a time from the original sample of "k" cases (Hair et al. 1992, 98). The expectation is that the proportion of firms classified correctly by the jackknife method would be less than that in the original sample due to the systematic bias associated with sampling errors. In this study, there was a difference of only two firms. At first glance, a reader might conclude that it is unusual to complete an analysis of this size and have a difference of only two firms between the two groups. However, with a very large sample such as the 2431 companies used in this study, the differences seem to diminish. The major issue is whether the proportion classified correctly by the validation test differs significantly from the 84 percent classified correctly in the original test. That is, is the difference in the two proportions classified correctly by the two tests due to bias, and if so is that bias significant? Of course, it may be obvious that a difference of only two cases will not be significant with a sample of 2431 companies. However, as in the aforementioned case of the Press's Q test of proportions, formal research requires the proof of a statistical test. The jackknife validation resulted in the correct classification of 83.9 percent of the firms. Since there are only two samples for analysis the binomial test is appropriate:

$$t = r - n p / [n p q]^{1/2} \quad (8)$$

Where:

t is the calculated t statistic
r is the number of cases classified correctly in the validation test.
n is the sample size.
p is the probability of a company being classified correctly in the original test.
q is the probability that a firm would be misclassified in the original test.

In this case: $1327 - 1327 (.607) / [1327 (.607) (.393)]^{½} = - .53$ is less than t_{05} 1.645. (9)

Thus, the null hypothesis that there is no significant difference between the proportion of firms classified correctly in the original test and the proportion classified correctly in the validation test cannot be rejected. Therefore, it can be concluded that while there may be some bias in the original analysis, it is not significant and it is concluded that the procedure will classify new firms as well as it did in the original analysis.

In addition to the validation procedure, researchers usually address the question of the equality of matrices. This is especially important in studies such as this where there is disparity in the size of the groups. One of the assumptions in using MDA is that the variance-covariance matrices of the two groups are equal. The SPSS program tests for equality of matrices by means of Box's M statistic. In this study Box's M transformed to the more familiar F statistic of 27.33 resulted in a zero level of significance. Thus, the null hypothesis that the two matrices are equal cannot be rejected.

SUMMARY AND CONCLUSIONS

The purpose of this study was to establish a financial profile of those firms identified as having the highest free cash flow multiples in the database of over 1357 firms created by (Damodaran 2014). Specifically, the analysis tested for significant differences in the financial profiles of firms with the highest free cash flow multiples and to compare those profiles with companies selected at random. In this study, the group of explanatory variables chosen for analysis includes two measures of return on investment, three measures of risk, and two measures of how the company may be perceived by investors at the margin (those willing and able to buy). It is the buying and selling of those investors that establish the market value of both equity and debt.

The results of the statistical analysis indicated first, that there was a significant difference in the financial profiles of the two groups of firms. The fact that the discriminant function separated two heterogeneous groups, and classified a significant proportion correctly is no surprise. In fact, the two groups of firms were so diverse in the matter of achieving high free cash flow multiples that it would certainly have been a surprise if the discriminant function had not been so efficient.

Table 2 reveals that the risk as measured by the coefficient of variation made the greatest contribution to the overall discriminating function. It is followed respectively by the measure of the five year expected growth rate, the return to total capital, long term debt to total capital (a measure of financial leverage), the unlevered bottom up beta (a measure of operating leverage), the price earnings growth ratio, and finally institutional investors buying activity. Explanations as to why the variables are associated with one group or the other are beyond the scope of this study. However, a few comments on the findings may be in order. Two of these of these results may have been expected, four had no apriori expectation (The relationships were simply not known), and one was a surprise.

The measures of operating risk (operating leverage) and the coefficient of variation in earnings before interest and taxes both measure risk and should be a negative factor in computing price and market capitalization. Market capitalization is contained in the denominator of equation (1). The larger that denominator the lower will be the free cash flow yield. However, operating risk is usually fixed and the coefficient of variation may just be a temporary assumption of risk traded off for a higher return. Thus, it may be reasonable to have expected that the coefficient of variation in earnings before interest and taxes would be associated with the high free cash flow yield firms, and just as likely to expect that high levels of operating leverage would be associated with the firms randomly chosen for the study.

There were no aprori expectations for the five-year growth rate, the measure of financial advantage, the price earnings growth ratio, and the ratio of debt to total capital (financial leverage). It was simply not known. The higher the level of debt, the higher will be the denominator in equation (1), but in this study the debt to total capital ratio instead of total debt was used to compute financial leverage.

The study resulted in one surprise. The return to total capital should be highly correlated with earnings before interest and taxes, and thus associated with the high free cash flow yield firms. However, this was not the finding and not a characteristic of high free cash flow yield firms. This finding is consistent with previous research (Tyler, Kemerer, and Payne 2015). No explanation of this empirical result can be offered here, and it may indeed defy logic. However, that finding as well as the other conclusions of the study is rich in content for needed further research.

This study has resulted in a contribution toward the construction of a theory that describes the risk-return and market perception characteristics of firms that have achieved the highest free cash flow yields. It is further suggested that since the model was validated without bias, it can be used to predict firms that may again achieve high free cash flow yields in the future. In order to make a more complete contribution to the theory, the aforementioned further research is needed. The evolution and appearance of a complete theory would aid managers, investors, academicians, and investment counselors by providing greater of knowledge on which to base financial decisions.

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TABLE 1
CLASSIFICATION RESULTS

Predicted Results

FCFY - FRC Classification

Actual Results	FCFY	FRC
FCFY	494	264
FRC	257	312

TABLE 2
RELATIVE CONTRIBUTION OF THE VARIABLES

Discriminant Variables	Coefficient	Rank
Return on Total Capital	.650	1
The Five Expected Year Growth Rate	.531	2
The Unlevered Sector Beta (Operating Risk)	-.414	3
Long Term Debt to Total Capital (Financial Risk)	.295	4
The Coefficient of Variation in EBIT	-.164	5
Institutional Investor Buying Activity	-.094	6
The Price Earnings Growth (PEG) ratio	.040	7