Differences in Risk Measurement for Small Unlisted Businesses

Edward A. Vos

The use of traditional risk measurement techniques for small unlisted businesses proves difficult due to a lack of market information. A sample of 209 small businesses in New Zealand was gathered to test the possibility of using accounting betas for risk measurement. While the accounting betas calculated for the listed companies in New Zealand did relate similarly to previous studies, several differences with the unlisted businesses are uncovered. The need to develop better measurement devices is highlighted if benchmarks for risk vs. return equilibrium are to be found for the class of small unlisted businesses.

"Some argue that there is no need to study small business as a separate topic because the same general principles of financial management apply to both large and small firms."

—Eugene F. Brigham, *Financial Management Theory and Practice,* Third Edition, The Dryden Press, 1982, p. 821.

INTRODUCTION

If small businesses' financial principles are similar to those of large businesses, it would be possible to measure risk of small unlisted businesses for determining equilibrium rates of expected return according to such models as the Capital Asset Pricing Model (CAPM) or the Arbitrage Pricing Theory (APT). Measurement of risk for small businesses which are not publicly listed presents an opportunity to check the appropriateness of using accounting betas as a surrogate for market betas. This study performs checks on a New Zealand data base of small unlisted companies' financial statements to compare resulting accounting betas of small unlisted firms to those of listed firms.

Modeling the risk profile of small unlisted businesses may not simply be a matter of establishing a [accounting] beta and judging subsequent returns as related to risk. Indeed, if the betas of small unlisted firms are

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unreliable measures of risk it becomes useful to develop a "small business risk model" to explain the large segment of the business environment that operates outside the traditional risk v return relationships described by the CAPM or the APT. Modern finance theories have not yet developed such a model, but rather explain lack of conformity to existing models in terms of failure to meet assumptions of the models. More development in this area is needed due to the very large numbers of small unlisted businesses and the need to measure their financial performance against some "norms." This study points toward the need for such developments by highlighting some difficulties with traditional financial risk measurement techniques.

TRADITIONAL RISK VS. RETURN MODEL
CAPM

Sharp [22, 23], Treynor [24], Mossin [17], Lintner [14, 15] and Black [5] built upon the work of Markowitz [16] to develop the Capital Asset Pricing Model. This model proposes that there exists an equilibrium price for a risky asset that relates the expected return of the asset to a minimum return established by the *risk free rate* plus additional return which is linearly related to the riskiness of the asset. Specifically,

$$E(R_i) = R_f + [E(R_m) - R_f] \cdot (\mathrm{COV}_{im}/\mathrm{VAR}_m)$$

where

R_i is the return on asset i
R_f is the risk free rate
R_m is the return on the market
$\mathrm{COV}_{im}/\mathrm{VAR}_m$ is the covariance of the return of asset i with the market divided by the variance of the market returns. This term is defined to be Beta.

Roll's [19] critique succeeded in shifting attention to other asset pricing models, such as the Arbitrage Pricing Theory. Yet the simple elegance of the CAPM remains as a framework for thinking about the relationship between risk and return.

SIZE EFFECT

Considerable research has been done on the influence the size of a firm has on its financial parameters. Handa, Kothari and Wasley [12] have

investigated the effect that size has on the sensitivity of a firm's beta. They provide evidence, however, that the size effect becomes statistically insignificant when risk is measured by betas estimated using annual returns. Chan and Chen [9] found that size affected betas only if five or fewer years of data are used. They suggest that if data over a longer period are used, the size effect disappears. Rogalski and Tinic [18] suggest that "abnormal" returns for small firms in January may not in fact be abnormal, but rather a result of increased risk for those firms in January. Carroll and Wei [8] suggest the absence of a linear relationship between risk and return even when size is taken into account. All of these studies used publicly listed companies as their data bases. By extending the concept of "small" to unlisted businesses, this study extends the understanding of the "size effect."

TESTING SMALL UNLISTED BUSINESSES

Small unlisted businesses are assets which have investors. These assets provide returns. The principles of financial management suggest—with either the CAPM or the APT—that there is a relationship between the level of return provided and the riskiness of the investment. Both the CAPM and the APT assume that risk averse investors are operating in frictionless markets. Both models are financial in that for both models, return is a monetary measurement.

Testing for the existence of the relationship between risk and return for small unlisted businesses presents several problems. First, which pricing model should be used? Each of the CAPM and the APT have their problems. Roll's criticism of the CAPM is but one of many problems found with this model, but it is the most important. The critical factors of the APT have not yet been fully developed. In either case, finding a bench-mark for the expected return of the "market" (R_m in the CAPM or $E(R_i)$ in the APT) is difficult.

This paper uses a CAPM model to examine risk measures of unlisted businesses. This is done since the unknowns in the APT are beyond the scope of this work. (What factors affect returns—overall, much less in small unlisted businesses? Are returns of all risky assets—as in Roll's critique—to be included in deciding this as Shanken [21] suggests? How can this be determined?)

MEASURING UNLISTED BUSINESS' RISK

It becomes necessary to determine the CAPM beta to gain a handle on the riskiness of the asset. This process for publicly listed companies is to regress

the returns of an asset (share) against the returns of the market [index]. The slope of this regression is the Beta. Unlisted businesses, however, have no publicly available market and thus provide no market price. The "unlisted business market index" does not exist. Thus comparing the returns of the unlisted businesses to the returns of the unlisted business market index cannot be done using ordinary regression techniques. Any financial measure of unlisted business performance is indeed difficult to attain. Publicly available data bases of unlisted business performance measures are rare if they exist at all.

Accounting statements of unlisted businesses are produced each year. These accounting statements provide the "handle" into assessing small business financial risk and return. The link between financial accounting statements and the market established measure of risk, Beta, has been well established. Ball and Brown [2] first showed that an accounting beta could be constructed from financial accounting statements according to the formula:

$$\text{Delta}(E_{it}) = a_i + b_i(\text{Delta}(E_{mt})) = e_{it}$$

where

$\text{Delta}(E_{it})$ is the one year change in earnings of firm i in year t
$\text{Delta}(E_{mt})$ is the one year change in an index of economy-wide earnings of firms in year t
b_i is the accounting beta.

In sampling 261 listed firms, they found that the Spearman Rank correlation between b_i and the market determined B_i was .53.

Further work in this area confirmed the link between an accounting beta and a market determined beta. Beaver, Kettler and Scholes [3], and Beaver and Manegold [4] refined and confirmed this relationship. Bowman [7] showed the theoretical relationship between systematic risk and financial accounting variables existed. Hill and Stone [13] refined the earlier work mentioned by considering the effects of financial and operating leverage in determining accounting betas.

This paper adopts the work of Hill and Stone [13] to calculate accounting betas. They showed a strong relationship between their "risk-composed equity beta" and a monthly market beta, significant at or above the alpha = .05 level. This "risk-composed equity beta" is defined as

$$B'_i = d(\text{ROE}_i)/d(\text{ROE}_m).$$

This is shown to be equivalent to

$$B_i^r = \frac{B_i^0/(1-f_i)}{\sum_{j=1}^{N} w_j B_j^0/(1-f_j)}$$

where:

$B^0{}_i$ is $d(\text{ROA}_i)/d(\text{ROA}_m)$
d is the first moment change with respect to time
f is the ratio of total equity to total assets
w is the weighting (by returns, i.e., profits)
m is the market of accounting returns in the total sample

THE DATA

The data for this study were collected in two groups, that of the listed companies in New Zealand, and that of the unlisted companies.

Financial statements of all New Zealand companies listed on the Stock Exchange as of the end of 1987 were collected from Datex in New Zealand. New Zealand companies are only required to publicly report annually, so each annual report was taken to be one observation. From the group of 229 listed companies, there were 778 observations. Many companies were newly listed during the 1984-1987 time period, others provided accounting statements of other than a 12 month basis, and several companies merged during the period. For these reasons, the 778 observations is not exactly equal to 4 years times 229 companies.

The unlisted company data were privately collected in the Waikato/Bay of Plenty region of New Zealand. There were 209 financial statements collected, which were for 97 companies which had not failed as of the beginning of 1988. These unlisted companies all meet the New Zealand definition of "small" used by the New Zealand Small Business Agency Act: "Less than 50 employees in the manufacturing sector, 25 or fewer in wholesale and retail, or fewer than 10 in the service sector."

From these initial data, usable observations were reduced for three reasons. First, calculations of the accounting beta require the calculation of the change in return (ROA, ROE). This therefore reduces the number of usable observations by requiring successive statements. A further restriction on the data used was that the share market beta could be calculated—i.e., the share price information existed for the year in question. Finally, the data were "cleaned" (see below for details) to reduce the effect of outliers. The data used are summarized in Table 1.

Table 1

	Summary of Data Used				
	Original Data Base		*Usable for Accounting Beta Calculations*		*Financial Year Ending 31 March:*
	No. of Cos.	*No. of Financial Statements*	*No. of Cos.*	*No. of Financial Statements*	*No. of Financial Statements*
Listed	229	778	65	147	57
Unlisted	97	209	44	88	N/A

Breakdown by Industry Type

Financial Statements by Industry Type	*Number of Listed*	*Number of Unlisted*
Pastoral	3	10
Building and Construction	9	31
Finance and Banking	4	
Rubber, Plastics & Other	3	5
Property	11	
Transport and Tourism	12	
Investment	14	7
Automotive	8	
Retail	6	
Misc Services	6	1
Apparel & Textile	8	
Food	6	
Liquor and Tobacco	3	
Medical Supplies	5	
Forestry	3	
Engineering	9	
Fertilizer & Chemicals	10	
Electronics & Appliances	5	
Media & Communication	8	
Mining	7	
Frozen Meat & Byproducts	4	1
Insurance	3	
Metals and Machinery		11
Mainly Wholesale		1
Mainly Retail		20
Printing & Packaging		1

RESULTS

Listed Companies

Accounting betas were calculated for all of the companies in the sample whose financial statements close as of 31 March, the most popular closing date. The market betas are based on weekly returns and are related to the University of Waikato share price index.

Spearman Rank correlation coefficients relating the accounting betas to the market betas (Table 2, confirms, in two of three years, the significant relationship between these two risk measures found by others.

Table 2
Spearman Rank Correlation Statistic
Relating Market Beta to Accounting Beta

Year	*Statistic*	*Number of Observations*
1985	.435*	16
1986	0.064	21
1987	.478**	20

Notes: * significant at alpha = .05
** significant at alpha = .025.

While no clear explanation for the insignificance of the 1986 statistic could be found, two possible explanations for this include: the [necessarily] small sample size; the significant changes to the tax code in 1986 which reduced by 8% the marginal tax rate mid-way through the year as well as introducing several other changes which would have affected the 1986 accounting statements. Nevertheless, the results of Hill and Stone are confirmed for two of three years. Further analysis in this paper does not depend upon all three years being significant.

Unlisted Companies

Outliers in the unlisted sample had a considerable effect on the raw statistics of the sample. By eliminating the outliers, only the cluster cloud of data remained. If the outliers had not been pruned, the resulting differences between the unlisted business sample and the listed business sample would only have been magnified. Thus, observations in the unlisted sample were deleted if they met any of the following criteria:

$d(\text{ROA}) < -3$
$10 < d(\text{ROE}) < -10$
$10 < \text{ROA} < -10$
$10 < d(\text{ROProfit}) < -10$
Change in profit > 100000

Once the accounting betas were calculated, the data were further pruned for graphing and raw statistical purposes by dropping the two observations whose accounting beta was less than −30.

Raw Statistical Comparisons

The unlisted business' accounting betas are more variable, as well as not normally distributed, even after having been "cleaned."

The difference in the standard deviation may be partly explained by the smaller sample size for the unlisted companies. Yet the differences in range and standard deviation between the two groups is marked, considering that the sample of unlisted companies was pruned.

Table 3
Raw Statistics on Accounting Betas

	Listed Companies	*Unlisted Companies*
Number of Observations	147	88
Minimum	−4.632	−23.056
Maximum	4.377	26.933
Mean	−0.119[1]	1.372
Standard Deviation	1.324	8.623

Note: [1] The New Zealand share market includes 6 companies which comprise over 50% of the total market capitalization. Therefore the arithmetic mean provided here of the betas of all of the companies, by giving equal weight to each of the 147 companies, provides a non-market weighted mean.

Figures 1 and 2, which show the probability distribution of the accounting betas, demonstrate the differences in the distributions of the two samples. While neither sample falls in a straight line, which would be the case if normally distributed, the listed companies' betas are close to normally distributed while the unlisted companies are not.

Risk vs. Return

The relationship between risk and return is expected to be linear with regard to the systematic risk. Since there is a well established theoretical link

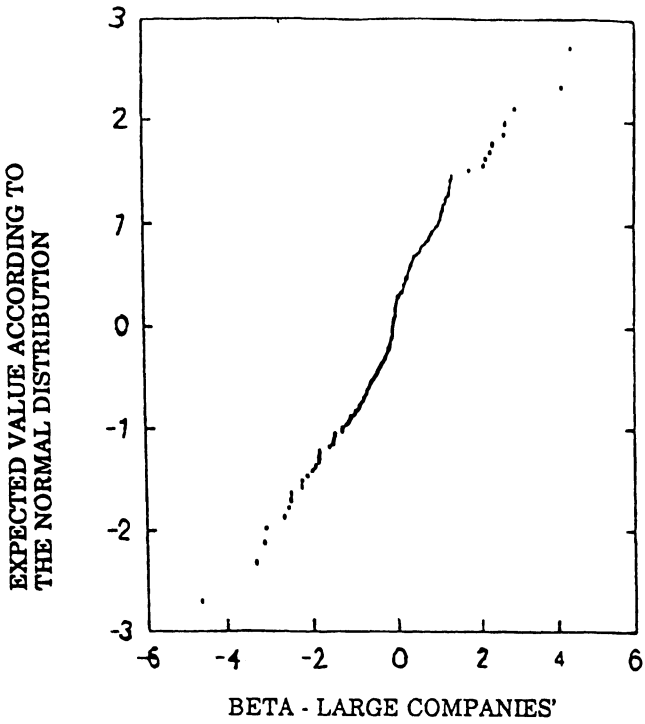

Figure 1. Probability Distribution of Unlisted Companies' Betas

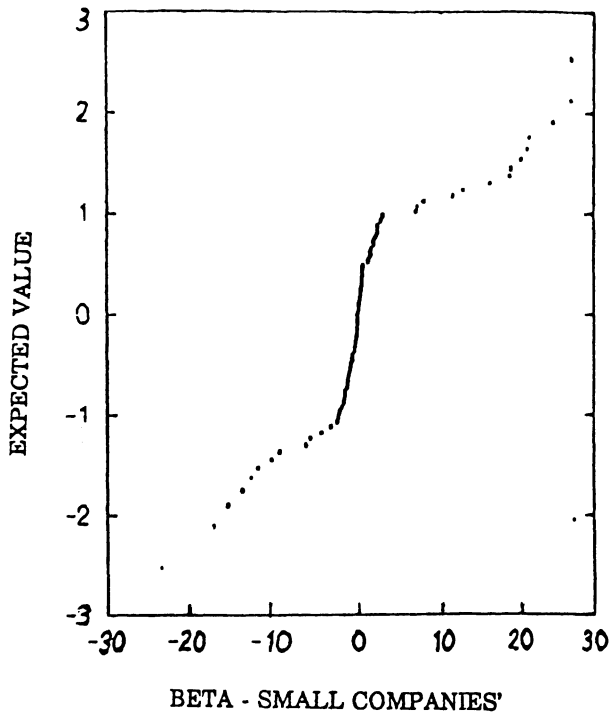

Figure 2. Probability Distribution of Listed Companies' Betas

Table 4
Spearman Rank Correlation Statistic
Relating Accounting Beta to:

	Listed Companies	*Unlisted Companies*
Return on Assets	.308*	−0.036
Return on Equity	.343*	0.041
Number of Observations	147	90**

Notes: * Significant at alpha = .05
** Including the two accounting betas < −30.

between accounting betas and market betas (Bowman [7]), and since the relationship between beta and return has been well tested for the listed companies by Friend and Blume [11], Black, Jensen and Scholes [6], and several others, the question is raised about the relationship of the unlisted companies' betas to their returns. Measurements of returns for the unlisted business sample are limited to the financially reported returns. It thus becomes interesting to look at the relationship that the accounting betas have to the accounting returns.

While the relationship between accounting beta and accounting return (i.e., reported profit) may be coincidental, it is interesting that the relationship is significant for the listed companies, and not significant for the unlisted companies. The possible reasons for this are discussed later.

SUMMARY

Risk measurement for unlisted businesses is difficult due to the lack of a market which trades these assets. Previous studies of the size effect have not included unlisted companies. The financial window into the performance of the unlisted business is the annual accounting statement. Several scholars have shown a strong relationship between a constructed accounting beta and the observed market place beta. Those results have been replicated in this study on the publicly listed companies in New Zealand, and partially confirmed.

Using the same (Hill and Stone [12]) approach to calculating accounting betas, it is found that the unlisted companies' betas are more variable and have a different distribution to the listed companies'. This is the case even after pruning the unlisted data set for outliers.

Differences in the accounting betas between the listed and unlisted companies include: range, variability, distribution, and relationship to accounting returns. In fact no dimensions of similarity were discovered.

Thus the accounting betas of New Zealand listed firms are significant explainers of risk, while the accounting betas of the unlisted firms may—or may not—be measuring a significant amount of risk. Reasons for these differences require further development.

CONCLUSIONS

The CAPM, and indeed common sense, suggest that there is a relationship between risk and return. This measure of risk, beta, is easily determined for assets whose returns are easily observable in a liquid market. The class of unlisted business, however, have no such market. This should not mean that the risk—return relationship is not present for unlisted businesses. Yet it is now clear that traditional measures of risk measurement may not be fully capturing the risk exposure. Let us first suppose that they are not being captured.

Does this mean that unlisted businesses are operating outside the bounds of the CAPM? Not necessarily. At least three possible explanations can be offered for declaring the [accounting] betas of unlisted firms inadequate measures of risk. First, diversification of unique risk leads investors to pay only for risk which is related to the risk of the overall economy. Questions must be asked about how diversified unlisted businesses are. Small unlisted business have large amounts of their human and monetary assets invested in non-diversified portfolios. The returns of these investments are therefore mostly a result of unique risk, and very little may be traceable to systematic risk.

Second, the lack of liquidity in the capital and labour markets for these assets makes the returns, as measured here, inelastic. The Markowitz risk averse investor will quit an asset not providing a sufficient return for a given level of risk. The unlisted business owner/manager does not have a ready option to quit being a butcher, for example, and then become a jeweller if the returns in the butchering business are insufficient for the level of risk. Indeed, the butcher may well continue in business at return levels which are less than sufficient simply because the skill of butchering is the only human asset available. Quitting the business may only happen after extended periods of loss. If, on the other hand, the investment in a business is purely financial and readily tradable in the market, the market quickly adjusts the price to an equilibrium level.

Third, accounting statements of unlisted businesses may not be adequate for measuring financial performance for several reasons. Unlisted businesses' accounts tend not to be audited, while all listed firms' accounts are audited. Unlisted firms' accounts are for private use, while listed firms use GAAP with a careful eye on their share price. This could result in the financial

statements of unlisted businesses not actually conveying the same "true and fair" information that Ball and Brown [1] first established was the case for listed companies.

Of course, it is also possible the riskiness of the unlisted businesses is indeed being captured by the accounting betas. It is possible that the risk (as measured by beta) of unlisted businesses simply has a wider range and variability than the risk of listed firms. Before this can be accepted, however, progress must be first made to eliminate the above three reasons as causing the differences observed here.

Brigham's (1982) assertion of the applicability of basic financial principles to small (unlisted) businesses may well be true. Yet this study applies some of these basic principles to a set of unlisted businesses and only finds differences. This should not mean that the relationship between risk and return does not exist, but rather that the traditional approach to measuring risk is lacking.

Each of the three possible reasons for these differences, as well as others not mentioned here, require further research if a better "small business risk model" is to be developed. This paper makes it clear that the existing model of the CAPM which equates risk to return is not adequate. If risk vs. return benchmarks are unavailable in the unlisted business sector, perhaps the best indicator of risk is to examine survival vs. failure models. At least for now it is clear that using the [accounting] betas described by the CAPM to establish risk vs. return equilibrium pricing is not sufficient.

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