Can Fixed Asset Liquidation Values Predict Stock Market Returns?

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ABSTRACT

This study raises the issue of current value-based measurements of long-term assets from a different perspective. The usefulness of the liquidation value of a firm's fixed assets for decision making purposes (through value-relevance) is demonstrated. By showing a relationship between the liquidation value of a firm's fixed assets and the firm's market return, this study will contribute to the existing accounting and finance literature by raising the issue of current value based measurements of long-term assets from a different perspective. Additionally, it provides additional evidence for consideration of long-term asset valuation in today's context of the planned United States GAAP convergence with International Financial Reporting Standards (IFRS). IFRS allows the use of current value and the liquidation value of a firm's fixed assets is one measure of current value.

This study examines the relationship between the liquidation values of a firm's fixed assets and the firm's stock market returns. The significance of this relationship is demonstrated by comparing it with the relationship between the book value of a firm's fixed assets and the firm's stock market returns. A stronger, or enhanced, relationship for liquidation values to stock market returns indicates its usefulness for decision making purposes.

Keywords: Book value, Firm book value, Firm liquidation value, Firm market capitalization, Firm market value, Fixed asset, International Financial Reporting Standards, Liquidation value, Market capitalization, Market value, Stock Market Returns, Value-relevance

INTRODUCTION

Accounting information (principally that relate to earnings) is the basis of most financial analysis of the market value of business enterprises. Occasionally, earnings-based analysis results in estimated market values that are below the true liquidation value of the firm. The most recent anecdotally known examples occurred during the 2002 era dot.com decline when some firms market values fluctuated below their net cash on hand position. This situation can result in acquisition and liquidation of the firm, with abnormal gains accruing to those with prior knowledge of the true liquidation value.

This paper studies the information content of the liquidation value of a firm's fixed assets in determining the stock market return of the firm. If the results of this study indicate a significant relationship, then evidence of the value-relevance of the liquidation value of a firm's fixed assets will be advanced. For this study, liquidation value is defined as the price that is reasonably attainable if an asset's sale is required within a relatively short period of time (an accounting cycle, or one year).

LITERATURE REVIEW

Since the initial recognition (Banz 1981) of the size effect on returns as an anomaly to the CAPM, no testing has refuted the effect. Ceteris paribus, a negative and significant correlation exists between average return and market equity size. Jegadeesh (1992) refuted the claim that size is merely a proxy for risk by noting the high

correlation between size and beta. Fama and French (1992) found that size and book-to-market equity combine to capture the cross-sectional variation in average stock returns. Fama and French (1992) do not attempt to explain the negative relationship between expected returns and firm size (except to suggest size as a proxy for risk), only to note the relationship's predictive usefulness. [Note: Firm size has become so prevalent in accounting research literature that Bujaki and Richardson (1997) noted its use to measure eighteen different theoretical constructs (including risk and expected return) presented in five accounting research journals (JAR, AR, JAE, CAR, and AOS) in 1992.]

The positive correlation between a firm's average returns and the ratio of a firm's book value of common equity to its market value of common equity has been demonstrated in numerous studies including Stattman (1980); Rosenberg, Reid and Lanstein (1985); Brief (1986); Ou and Penman (1989, 1994); Agrawal, Mohamed and Monem (1996); Fama and French (1992, 1993, 1995); Lev and Thiagarajan (1993); Bernard (1994); Ohlson (1995); and Frankel and Lee (1998).

The ratio of firm book-to-market equity value has been demonstrated to possess predictive power for firm stock market returns through a long line of research highlighted by Fama and French (1992) which found that size and book-to-market equity combine to capture the cross-sectional variation in average stock returns. Chung and Charoenwong (1991) showed that the risk of stocks is inversely (positively) related to the ratio of assets in place (growth opportunities) to market value.

Lockridge, et al. investigated the relationship between the liquidation value of a firm's fixed assets and the firm's market capitalization (Lockridge, Saunders and Sridharan, 2009). Their finding indicated a strong relationship between the liquidation value of a firm's fixed assets and it's market capitalization.

A basic tenet of accounting theory is the underlying assumption that a firm is a going concern. If an indeterminate life span is basic to accounting theory, little thought is given to the value of the firm if operations end. However, financial studies of capital budgeting under uncertainty have demonstrated that even the simple ability to abandon a capital project has value in a multi-period analysis (Hirshleifer and Riley 1992). Whenever the abandonment value of a project exceeds the value of any one of the several possible outcomes from continuing operations, the abandonment option also reduces the variability (risk) of the project outcomes by establishing a higher floor on the project's value (Berger, Ofek, and Swary 1996; Hirshleifer and Riley 1992).

Burgstahler and Dichev (1997) hypothesized that market value is an increasing convex function of expected earnings (adaptation value) for a given level of adaptation value (expected earnings). The results of the Burgstahler and Dichev's empirical tests are consistent with the hypothesized form of the valuation relationship.

Tests of Burgstahler & Dichev's (1997) model used book value as a surrogate for adaptation value, although they acknowledge that book value is not a perfect surrogate. Which possible adaptation value should be used in Burgstahler and Dichev's valuation model? The only adaptation value that should be worthwhile is an adaptation value that is available to the shareholders. The shareholders can force a reallocation of the company's assets by collectively selling their shares to an external entity that seeks control of the company for the purpose of reallocating the company's assets to another purpose or to liquidate the company's assets for value. Therefore, the liquidation value (LV) of the firm is considered valid for this study and is the price that is reasonably assured of being attainable if the asset's sale is required within a reasonable period of time (an accounting cycle, or one year).

RESEARCH DESIGN

Based on the preceding discussion it can be postulated that a firm's stock market returns (R) is related to its LV. Because short-term and financial assets are relatively liquid, their liquidation values are close to their book values. If the book value of fixed assets is replaced with the liquidation value of the fixed assets (LV_{FA}), the total assets should be a better representation of the LV for the firm.

LV_{FA} can be estimated using the relationship:

$LV_{FA} = b_s MV_{FA}$; where
LV_{FA} = Fixed asset liquidation value,
b_s = coefficient of asset specificity (non-liquidity), and
MV_{FA} = Market value of used fixed assets.

The coefficient of asset specificity (CAS) can range from zero to one, with one being very marketable (liquid) assets. If the sample is restricted to one industry where a ready market exists for the fixed assets then the CAS can be assumed to be very close to one. That means the LV_{FA} will equal the MV_{FA}.

The market value of used fixed assets can be estimated using the factors of replacement cost of equivalent new assets and the age of the used assets. Beidleman (1973) found that age proxies for most of the major factors that affect the value of used capital assets like obsolescence, maintenance costs, and functional degradation. Beidleman's (1973) study was confirmed and expanded by Downs and Shriver (1992) and Bar-Yosef and Lustgarten (1994). Therefore, the market value of used capital assets is estimated, in this study, by dividing the replacement cost of an equivalent new asset by the estimated age in years plus one-half year. Replacement cost is represented by the historical cost multiplied by the specific asset class producer price index for the asset's average age. Average age of the fixed assets was calculated by dividing the accumulated depreciation by the average yearly depreciation expense.

The parallel of these findings with accounting fundamental analysis and with capital asset pricing model theory leads to the tenet that firm stock return (value) has two components, a risk free (adaptive value, or book value) component and a scaled risky (recursive value, or capitalized earnings value) component. If liquidation value is greater than book value, and book value is included in liquidation value, then the liquidation value will reflect a similar component position to total firm value as book value does to total firm value. However, when book value is greater than liquidation value it includes components that possess some risks of realization under some future states (e.g. tax timing accruals, etc.); therefore, the component of book value that is represented by liquidation value would be more risk-free than the components of book value that are not represented by liquidation value. Therefore because the ratio of LV/MV reflects the risk-free nature of liquidation value, it should be a better proxy of a firm's relative level of risk than the ratio of BV/MV.

The research question is:

Research Question: The ratio of Firm Liquidation Value to Firm Market Value (LV/MV) is a better predictor of stock market returns than the widely examined ratio of Firm Book Value to Firm Market Value (BV/MV)

METHODOLOGY

Sample selection began with the firms currently reported within the Compustat Industry Classification Codes # 4210, 4213, 4400, 4412, 4512, 4513, and 4522. These classification codes include companies principally engaged in the transportation of passengers and/or freight. A high percentage of these companies' assets consist of trucks, trailers, ships, or airplanes. These types of assets possess high multi-user adaptability and resultantly a free and fair market for liquidation. Sample selection included some firms that did not operate for the entire sampling period of the years 1991-1998. The United States Postal Service was eliminated from the SIC Code 4210 company sample initially, though missing data (i.e. Market Value) would have eliminated it later in the process. The sampling period was chosen in an attempt to eliminate the residual effects of the much more regulated environment that these industries operated in until the 1980's.

The total number of companies included in the Compustat data files included all 135 companies that reported specific data items for any annual period. Considering an eight year period, there were 1,080 observations possible. The samples were reduced by those firm observations for which all required Compustat annual data items were not reported in the year of the sampling observation. The process of reduction because of missing data was begun.

The first sample adjustment was to eliminate potential observations where the annual stock return data was missing, which left 542 observations. The second sample adjustment was to eliminate remaining potential observations where the market value and/or book value data was missing, leaving 541 observations. The third sample adjustment was to eliminate two potential observations where the liquidation value was missing because one or more data items required for its computation was missing. The fourth adjustment was to eliminate remaining potential observations where firm earnings were negative, which left 417 observations. The fifth sample adjustment before preliminary data analysis was to eliminate remaining potential observations where the calculated firm liquidation values were negative, as the firm liquidation value of a corporation to its shareholders is by definition not less than zero. This elimination is consistent with Frankel and Lee (1998), Fama and French(1996), and Burgstahler and Dichev's (1997) exclusion of firms with negative book value from their tested model's sample. This elimination left 240 complete observations.

The book value of the firm (BV) represents the sum of the Compustat annual data items #60 *'Common Equity – Total'* and #35 *'Deferred Taxes and Investment Tax Credit (Balance Sheet)'*. This is a generally accepted metric for owner's equity used in many studies including Fama and French (1992, 1993, and 1995).

Fixed Asset Liquidation Value

As discussed earlier, because the sample is restricted to one industry where a ready market exists for the fixed assets the CAS can be assumed to be very close to one and LV_{FA} will equal the MV_{FA}. Then:

$LV_{FA} = (b_s \times IDX \times HC_{FA}) / (A + 0.5)$; where

IDX = specific asset class price inflator index, HC_{FA} = historical cost of fixed assets, and A = estimated age of the asset (in years). The estimated age of the asset in years is calculated using the solvency ratio; accumulated depreciation/depreciation expense (Kimmel, Weygandt and Keiso 2000). The addition of 0.5 year to this ratio's divisor is an arbitrary naïve estimate of the reduction necessary to account for the tax costs of liquidating assets that for tax purposes had been depreciated using the MACRS system with a 0.5 year convention. Note that the liquidation values reflect the reality of a residual value of fixed assets that parallels book depreciation with a residual.

The historical cost of fixed assets (HC_{FA}) is proxied by the Compustat annual data item #7 *'Property, Plant, and Equipment – Total (Gross)'*.

Average age of the fixed assets is estimated by dividing the Compustat annual data item #196 *'Depreciation, Depletion, and Amortization (Accumulated) (Balance Sheet)'* by the Compustat annual data item #14 *'Depreciation and Amortization'*.

The specific asset class price inflator index (IDX) is derived from the *U.S. Department of Labor, Bureau of Labor Statistics, Producer Price Index – Commodities, Transportation equipment – WPU14 and Aircraft and aircraft equipment – WPU142.*

The liquidation value of the firm (LV) results from adding the estimated fixed asset liquidation value (LV_{FA}) to the book value of the firm (BV), and subtracting the value of the Compustat annual data item #8 *'Property, Plant, and Equipment – Total (Net)'* from the resulting value.

Firm earnings are calculated by adding Compustat annual data item #18 *'Income Before Extraordinary Items'* and Compustat annual data item #50 *'Deferred Taxes (Income Account)* and subtracting Compustat annual data item #19 *'Dividends – Preferred'* consistent with Fama and French.

Summary of Sample Data Analysis for Return Regressions

The observations with the greatest undue influence on the regression were removed one at a time and the remaining observations were reanalyzed to determine the remaining observation with the greatest undue univariate and/or multivariate influence.

The result of the sample data analysis for the return regressions was the identification of seven data observations as having undue influence on the regression equations. The removal of these seven observations leaves a sample data set containing 233 observations. This reduced data set of 233 observations served as the basis for evaluation of the hypothesis. Table 1 summarizes the removed observations and their influence statistics when removed.

Table 1
Summary of Removed Outlier Statistics
For Return Regressions

Observations	Z-Residual	Mahalanobis	Cook's	Leverage	Covratio
Carnival 97	10.36659	2.23214	.49716	.00934	.16197
Atl. Cst. Air 95	5.87337	1.99481	.14819	.00838	.63430
AirTran 95	4.99266	2.34008	.12031	.00987	.73015
Trico Marine 98	.15349	50.02345	.00276	.21196	1.29181
Sky West 98	3.75881	.85675	.03772	.00365	.84503
Tidewater 93	3.57921	.39651	.02571	.00169	.85853
Airborne 97	3.27742	.64116	.02551	.00275	.88354

Table 2
Statistical Results of Step One of the Hypothesis Testing

Statistic	Model One
n	233
Dependent variable	R
Independent variable	LV/MV
R	.283
R Square	.080
Adj. R Square	.076
Coefficients-	
constant	.583
std. $error_{con.}$	.059
95% C. I.	.466/.699
LV/MV	-.873
$std.error_{LV/MV}$	.195
95% C. I.	-1.256/-.490
t-statistics-	
constant	9.864
LV/MV	-4.487
p-value-	
constant	.000
LV/MV	.000
Model-F-statistic	20.129
-Durbin-Watson	1.851
-Collinearity	
-condition index	3.130
Pearson Correlations	
-R to LV/MV	-.283
Mean-Std. Dev. - R	.367/.544
- LV/MV	.247/.176

RESULTS

Regression Analysis

The hypothesis ("The ratio of Firm Liquidation Value to Firm Market Value … is a better predictor of stock market returns than the widely examined ratio of Firm Book Value to Firm Market Value…") was tested using a three step process. First, a simple regression equation with the dependent variable of stock return (R) and the independent variable of liquidation value of the firm scaled by market value of the firm (LV/MV) was analyzed. As summarized in Table 2, the results of this regression are significant for the portion of the variance in the dependent variable that is explained by the model.

Second, a simple regression equation with the dependent variable of stock return (R) and the independent variable of book value of the firm scaled by market value of the firm (BV/MV) was analyzed and compared to the first regression. As summarized in Table 3, the results of the analysis of this regression indicate that the relationship is significant for the portion of the variance in the dependent variable that is explained by the model and, that BV/MV explains more of the variance in R than LV/MV explains.

Table 3
Statistical Results of Step Two of the Hypothesis Testing

Statistic	Model One	Model Two
n	233	233
Dependent variable	R	R
Independent variable	LV/MV	BV/MV
R	.283	.324
R Square	.080	.105
Adj. R Square	.076	.101
Coefficients-		
constant	.583	.719
std. $error_{con.}$	.059	.076
95% C. I.	.466/.699	.570/.868
BV/MV		-.520
std. $error_{BV/MV}$		.100
95% C. I.		-.716/-.323
LV/MV	-.873	
std.$error_{LV/MV}$	.195	
95% C. I.	-1.256/-.490	
t-statistics-		
constant	9.864	9.511
BV/MV		-5.210
LV/MV	-4.487	
p-value-		
constant	.000	.000
BV/MV		.000
LV/MV	.000	
Model-F-statistic	20.129	27.144
-Durbin-Watson	1.851	1.847
-Collinearity		
-condition index	3.130	4.241
Pearson Correlations		
-R to BV/MV		-.324
-R to LV/MV	-.283	
Mean-Std. Dev. - R	.367/.544	.367/.544
- BV/MV		.678/.339
- LV/MV	.247/.176	

Third, as a further check, a multiple regression equation with the dependent variable R and the two independent variables of BV/MV and LV/MV was run and analyzed for the significance of both independent variables and to detect if LV/MV contains incremental value relevance over BV/MV in determining R. In the multiple regression model both independent variables are significant and the model explains more of the variance of the dependent variable R than either of the simple regression models. These results are summarized in Table 4.

Table 4
Statistical Results of Step Three of the Hypothesis Testing

Statistic	Model One	Model Two	Model Three
n	233	233	233
Dependent variable	R	R	R
Independent variable	LV/MV	BV/MV	BV/MV,LV/MV
R	.283	.324	.368
R Square	.080	.105	.135
Adj. R Square	.076	.101	.128
Coefficients-			
constant	.583	.719	.786
std. error$_{con.}$	.059	.076	.078
95% C. I.	.466/.699	.570/.868	.632/.940
BV/MV		-.520	-.407
std. error$_{BV/MV}$		.100	.106
95% C. I.		-.716/-.323	-.615/-.198
LV/MV	-.873		-.579
std.error$_{LV/MV}$	.195		.204
95% C. I.	-1.256/-.490		-.981/-.177
t-statistics-			
constant	9.864	9.511	10.062
BV/MV		-5.210	-3.836
LV/MV	-4.487		-2.840
p-value-			
constant	.000	.000	.000
BV/MV		.000	.000
LV/MV	.000		.005
Model-F-statistic	20.129	27.144	18.019
-Durbin-Watson	1.851	1.847	1.892
-Collinearity			
-Tolerance	1.000	1.000	.859
-VIF	1.000	1.000	1.164
-condition index	3.130	4.241	5.065
Pearson Correlations			
-R to BV/MV		-.324	-.324
-R to LV/MV	-.283		-.283
-LV/MV to BV/MV			.376
Mean-Std. Dev. - R	.367/.544	.367/.544	.367/.544
- BV/MV		.678/.339	.678/.339
- LV/MV	.247/.176		.247/.176

Validation and Sensitivity Tests

Additional regressions were performed for model validity and metric sensitivity assessment. In review, the sample selection began with the firms reported within the Compustat Industry Classification Codes # 4210, 4213, 4400, 4412, 4512, 4513, and 4522 that are principally engaged in the transportation of passengers and/or freight. This sample was chosen because of the relative ease of estimating the liquidation value of their assets without proprietary information. However, the transportation sector poses challenges to accumulating a sample for

evaluation. This industry has high variability of firm size, high variability of earnings and returns (between sub-sectors and within firms over time) and varying degrees of political intrusion (regulation, subsidy, etc.) because of their impact on national commerce. All of these factors combined lead to samples for validation tests that are sub-samples of the tested regression samples.

The sample used for validation of the test of the relationship between the independent variable liquidation value of the firm scaled by market value of the firm and the dependent variable firm stock return was obtained by eliminating from the regression sample all of the observations of the year 1998. This changed the sample size from 233 observations to 191 observations. The results are summarized in Table 5 (Validation Model) and compares favorably to the regression sample results (Model Three).

Table 5
Statistical Results of Validation of the Hypothesis

Statistic	Test Model	Validation Model
n	233	191
Dependent variable	R	R
Independent variable	BV/MV,LV/MV	BV/MV,LV/MV
R	.368	.360
R Square	.135	.129
Adj. R Square	.128	.120
Coefficients-		
constant	.786	.816
std. error$_{con.}$	.078	.088
95% C. I.	.632/.940	.642/.991
BV/MV	-.407	-.403
std. error$_{BV/MV}$	.106	.121
95% C. I.	-.615/-.198	-.641/-.165
LV/MV	-.579	-.622
std. error$_{LV/MV}$	.204	.230
95% C. I.	-.981/-.177	-1.076/-.167
t-statistics-		
constant	10.062	9.234
BV/MV	-3.836	-3.344
LV/MV	-2.840	-2.699
p-value-		
constant	.000	.000
BV/MV	.000	.001
LV/MV	.005	.008
Model-F-statistic	18.019	13.959
-Durbin-Watson	1.892	1.764
-Collinearity		
-Tolerance	.859	.883
-VIF	1.164	1.133
-condition index	5.065	5.140
Pearson Correlations		
-R to BV/MV	-.324	-.309
-R to LV/MV	-.283	-.278
-LV/MV to BV/MV	.376	.342
Mean-Std. Dev. - R	.367/.544	.398/.543
- BV/MV	.678/.339	.664/.326
- LV/MV	.247/.176	.242/.171

SUMMARY AND CONCLUSIONS

Testing provided strong evidence to support the value relevance of liquidation value to firm stock returns. Though the portion of the variance of the dependent variable that was explained by liquidation value in the models was less than the portion of the variance of the dependent variable explained by book value in the models, liquidation value was significant alone in the simple regressions and was incrementally value relevant in combination with book value in the multiple regressions.

The expected contribution of this study and the line of research it generates will be to contribute to the existing accounting and finance literature by raising the issue of current value based measurements of long term assets from a different perspective. An additional expected contribution will be to the existing accounting literature by demonstrating the incremental value relevance of liquidation value, the provision of reporting incentives for disclosure of this information, and thereby the reduction of informational asymmetry between financial analysts and other financial professionals and the general investing public.

In summary, liquidation value has explanatory power in relation to stock market returns, and by proxy has value for decision making purposes.

SIGNIFICANCE OF THE STUDY

By demonstrating the usefulness for decision making purposes (through value-relevance) of the liquidation value of a firm's fixed assets (in determining firm stock market return), this study will contribute to the existing accounting and finance literature by raising the issue of current value based measurements of long-term assets from a different perspective. It provides additional evidence for consideration of long-term asset valuation in today's context of the planned United States GAAP convergence with International Financial Reporting Standards. An additional expected contribution to the existing accounting literature will be the provision of incentives toward disclosure of liquidation value, and thereby the reduction of informational asymmetry between financial analysts and other financial professionals and the general investing public.

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