Optimal Weights for Accounting Earnings and Cash Flows for Explaining Stock Return of Insurance Companies

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ABSTRACT

The objective of this paper is to derive a composite index from earnings and cash flows that could be used to better evaluate insurance companies. One significant difference between earnings and cash flows is depreciation, and in the case of insurance industry, the timing of recognition of premium income and expense paid out to claims can also cause significant difference between earnings and cash flows. Thus, there might be important components that are found in earnings of insurance companies but not in cash flows, or vice versa. We propose to create a composite index which is a weighted average of accounting earnings and cash flows that can explain stock return better than either earnings or cash flow alone. The advantage of this approach is that full information would be utilized for evaluating performance of insurance companies. Using this approach, we found that the optimal weight for earnings and cash flow for the insurance industry is found to be approximately 79% and 21%, respectively. Such information may help managers of insurance firm to better manage the cash flow in order to maximize value of the firm for shareholders.

Journal of Insurance and Financial Management

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1. Introduction

Realizing that earnings alone have limited predictive power with regards to the future performance of a firm, investors have also embraced cash flow in their criteria to assess and value the firm. While the Earnings per Share (E) shows the accounting income earned, it is equally important to understand the quality of those earnings and how they will impact the value of the firm in question going forward. It is therefore equally important, if not more important, to acknowledge a company’s cash flow before judgments could be rendered regarding the firm’s value. While the accounting earnings as measured by Earnings per Share is determined on the principles of conservatism, prudence, and general provision for unforeseen circumstances that may adversely affect the firm’s performance in the future, accounting earnings might not reveal the true cash generating abilities of a firm due to its treatments of non-cash items such as depreciation and amortization. In the case of insurance companies, the difference between earnings and cash flow might go beyond depreciation and amortization. Major portion of insurance revenue is derived from premiums, which is received as cash in advance, but is recognized as income only after it has been earned over time. In addition, there is also timing difference between when insured loss is recognized and when actual payments for loss incurred are made. Due to these factors, there might be significant difference between earnings and cash flows for many insurance firms. Thus, using both measures is particularly beneficial for evaluating performance of insurance companies. And to omit either one would cause one to fall short of utilizing full information to assess insurance firm’s performance. Thus, to assess the true value of an insurance operation, it is best to do so with both cash flow and earnings combined. A question would then arise: Just how much weight should investors place on one or the other in trying to assess the value of stock for an insurance company?

2. Literature Review

Research in the area of evaluating the relationship between stock performance and conventional accounting earnings began in late 1960s. It was reported that there is a positive relationship between accounting earnings and stock prices (Ball and Brown, 1968). However, the market would not automatically adjust stock prices whenever there were announcements of positive changes accounting earnings; such phenomenon may be due to the possibility that market participants also consider the underlying economic aspects of the earnings from various sources of information. (Kaplan and Roll, 1972)
Foster (1975) narrowed the investigation within the insurance industry and examined the relationship between change in stock prices of non-life insurers and various accounting earnings measures, including underwriting earnings, investments, and capital gains and losses. The results indicated that underwriting earnings measures seemed to have the strongest relationship with price changes in insurance stocks.

In more recent researches, it is found that investors in insurance stocks react significantly more on “street earnings” than accounting earnings announcements (Cotei, Farhat, and Miranda, 2012), and “there is a strong bias towards the reporting of a Street numbers that is higher than the GAAP earnings number”, where GAAP represents Generally Accepted Accounting Principles and “street earnings” represents “earnings announced by corporations in their press releases and tracked by analyst estimate clearinghouse services”. These street earnings excluded a variety of expenses under GAAP (Bradshaw and Sloan, 2002). This could be a factor that weakens the relationship between stock performance of insurance companies and conventional earnings.

The characteristics of insurance companies as financial firms also might not lend themselves to be easily evaluated by conventional earnings measures, either for valuation purpose or for performance evaluation. Demodaran (2009) suggested that insurance companies as financial services firms in recent days have two major characteristics that pose challenges for valuation of these companies: cash flows are not easy to estimate, and the regulatory environment in which they operate could affect their capitalization, investment and growth.

There are a few recent researches in the area of valuation methods used by the financial practitioners to value insurance companies. Demodaran (2009) compared several alternative methods for valuing financial services firms, including equity valuation models and enterprise valuation models. He concluded that financial services firms are best valued by discounted cash flow (DCF) method, with actual or potential dividends instead of free cash flows. In addition, Nissim (2010) concluded that relative valuation models are most commonly used in practice for the insurance industry. He examined the relative valuation models in the U.S. insurance industry and suggested that book value multiples may be used to value insurance companies relatively well as compared to earning-based multiples. In sum, while there have been many studies conducted on estimating the value of insurance companies, less has been done in the area of developing a metric that better explain or evaluate the stock performance of insurance companies.
3. Objective

This paper aims to derive an optimal earnings index that incorporate information on accounting earnings and cash flows which can explain the stock return better than either one of them. Using earnings and cash flow data of insurance companies, we seek to derive optimal weights to be applied to earnings and cash flow that would maximize its explanatory power for share price performance. This approach, in effect, allows analysts to use the best combination of these two earnings metrics to assess stock performance.

4. Methodology

Data on Earnings per Share and Cash Flow per Share were collected for 66 companies in the insurance industry from Bloomberg Terminal. The insurance industry is a suitable industry for this study primarily because of its unique characteristics of how premium income and insurance loss are recognized. Items such as realized investment gains and change in insurance liability might also be a cause for difference between earnings and cash flows.

The market’s perception of firm performance is reflected in the share price. In an efficient market, change in any variable that matters to shareholders should be correlated with stock return. Thus, the degree to which a metric captures such relevant variables is reflected in the metric's degree of correlation with share price. Therefore, the analysis of the correlation between each metric and stock return can reveal the degree of relevance of the metric to the market.

One way to determine whether a variable is important in determining firm’s performance is to evaluate its correlation with stock return. Thus, to see which earnings metrics has a stronger correlation with stock return, stock return can be regressed on either earnings or cash flow, but not together: because earnings and cash flows might be highly correlated; it is well known that regressions with two linearly correlated explanatory variables in the same equation at the same time will cause an econometric problem known as multicollinearity, which can lead to bias and unreliable results. To avoid such problem, the equation will be adjusted before it is regressed in the next section.
5. Data and Variables

**Data Explained**

Using empirical data for the period starting the last trading day of year 2015 and ending the last trading day of year 2016, we seek to examine the correlation of Cash Flow per Share and Earnings per Share with the actual return in that time horizon, but more so, the magnitude of each vis a vis the other. Therefore, the underlying goal is to discover the weight of future cash flow and the weight of future Earnings per Share in explaining the companies’ stock return.

Data for stock price, Earnings per Share (E), Cash Flows per share (C) were gathered from Bloomberg were as of December 31 2015 and December 30 2016. In terms of actual return, we collected data for total return from December 31, 2015 to December 30, 2016 on Bloomberg Terminal. Change in C and E were calculated as the difference between the values of such variables as of December 31, 2015 and values as of December 30, 2016.

**Variables Explained**

*i. Actual Return \[AR\]*

Actual return for the period (2006) was simply derived at by subtracting the price at the beginning of the period from that at the end of the period, then adding in any dividends within the period and expressing the outcome as a fraction of the original price.

\[
AR = \frac{P_2 - P_1 + Div}{P_1}
\]  

(1)

Where \(P_1\) denotes the share price at the end of Period 1, \(P_2\) represents the price at the end of the Period 2, and \(Div\) represents the sum of all dividends declared for that security within the Period 2.

*ii. Earnings Index \[I\]*

Since all the important factors that are relevant to company performance are factored into share price, variables with strong correlation with stock return are likely to be important to shareholders. Earnings index (I) is a synthetic metric compose of various earnings measure of the firms. Such index may be viewed as a form of real earnings or the level of earnings that is being impounded in the share price. With regards to each individual security in the sample, (I) is a representation of that securities level of proxy earnings (and not the level of accounting earnings itself) at a given point in time. Important to note here that (I) is a function of both accounting earnings as measured by E and cash flow generating abilities of a company as
measured by $C$, where each has some level of effect on the overall earnings index. Denoting the weight of $E$ with $w_E$ and that of $C$ with $w_C$, we represent the earnings index as a function of $E$ and $C$ as follows

$$I = w_E * E + w_C * C$$

(2)

Where $E$ = Earnings per share

$C$ = Cash Flow per share

$I$ = Earnings Index or Composite Index

$w_E$ = weight for $E$ in determining the earnings index.

$w_C$ = weight for $C$ in determining the earnings index, and

$w_E + w_C = 1$, as there are only two components considered in the index.

We have a total of three metrics: $E$ (when $w_E = 1$ for $I$), $C$ (when $w_E = 0$ for $I$), and $I$ (when $0 < w_E < 1$ for $I$) and the correlation of these three metrics with share price will be analysed in the second half of this paper.

Before correlation between the metrics and share price can be analysed, the three metrics are expressed in change form. Correlation between the changes in the metrics and the change in share price will be analysed through regressions in the following section. The change in metrics are $\Delta E$, $\Delta C$, and $\Delta I$. The last metric is basically derived from (2) with different weights assigned to $w_E$ and $w_C$.

A change in (I) would therefore be a function of the respective changes in $E$ and $C$ over the period under consideration, we can express change in earnings index ($\Delta I$) as follows:

$$\Delta I = w_E(E_2 - E_1) + w_C(C_2 - C_1)$$

(3)

Where $\Delta I$ = change in earnings index ($I$), $E_1$ = $E$ for Period 1, $E_2$ = $E$ for Period 2, $C_1$ = $C$ for Period 1, $C_2$ = $C$ for Period 2.

To establish a meaningful comparison among securities, we divide (3) by of the value of the security at the beginning of the period to get $\Delta I$ as a percentage of $P_1$ as follows:

$$\frac{\Delta I}{P_1} = \frac{w_E(E_2 - E_1) + w_C(C_2 - C_1)}{P_1}$$

(4)

Thus, the change in index has now been normalized by price to be expressed in percentage in order to be regressed with stock return, which is also expressed in percentage.
We establish the following linear relationship between AR and $\Delta I/P$

$$ AR = \alpha + \beta \left( \Delta I/P \right) = \alpha + \beta \left( \frac{w_E(E_2 - E_1) + w_C(C_2 - C_1)}{P_1} \right) \quad (5) $$

We know that $0 < w_E < 1$ and $w_C = 1 - w_E$. Our goal here is to find the value of $w_E$ such that $\Delta I/P$ (the index) has the strongest statistical relationship with AR. We achieve this by regressing AR against $\Delta I/P$ while setting $w_E$ to values between 0 and 1, to see the degree of statistical correlation (as indicated by the t-statistics for the beta coefficient) between AR and $\Delta I/P$ for each value of $w_E$. It is found that $w_E = 0.79$ provides stronger correlation than other values for $w_E$. Furthermore, the composite index with such weight has stronger correlation with stock prices than pure accounting earnings ($w_E = 1$) or pure cash flow ($w_E = 0$).

Since Cash Flow per Share (C) is derived by adding back depreciation and other adjustments to earnings (such as amortization and other irregular expense), we can write:

$$ C = E + A \quad (6) $$

where A represents all adjustments added back to earnings for deriving cash flows (including depreciation, amortization and other irregular expenses).

Since Earnings per Share (E) and Cash Flow per Share (C) has high correlation with each other, regressing with both of them as explanatory variables at the same time can cause multicollinearity. To mitigate the problem of multicollinearity, we transformed Equation (5) by expressing Cash Flow per Share (C) in terms of EPS (E) and Adjustments (A), so that the explanatory variables are changed to E and A (instead of E and C which are highly correlated).

Thus, we have:

$$ AR = \alpha + \beta \left( \frac{w_E(E_2 - E_1) + w_C(C_2 - C_1)}{P_1} \right) \quad (7) $$

Since the change in Earnings per Share ($E_2 - E_1$) and change in Adjustments ($A_2 - A_1$) has lower correlation with each other than that between change in Earnings per Share ($E_2 - E_1$) and change in Cash Flow per Share ($C_2 - C_1$), multicollinearity problem will be reduced significantly.

(7) can be simplified to become:

$$ AR = \alpha + \beta \left( \frac{E_2 - E_1}{P_1} + (1 - w_E) \frac{A_2 - A_1}{P_1} \right) \quad (7.1) $$
Note that we have normalized the change in E and A by share price in (7.1) in order to transform them into \( \frac{(E_2 - E_1)}{P_1} \) and \( \frac{(A_2 - A_1)}{P_1} \), which represent change in Earnings per Share (E) in percentage and change in Adjustment (A) in percentage, respectively. The regression of equation (7.1) is referred to Reiterative Approach because the regression is repeated under various set values of \( w_E \).

Another estimation approach is called Non-linear Regression with Restricted Coefficient Approach, which regresses equation (8) with non-linear least squares, with parameters \( \alpha, \beta \) and \( w \), in order to obtain the optimal weighting for Earnings per Share \( (w_E) \). Equation (8) is rewritten from (7.1) as below:

\[
AR = \alpha + \beta \left( \frac{E_2 - E_1}{P_1} \right) + \beta \ast (1 - w_E) \ast \left( \frac{A_2 - A_1}{P_1} \right)
\]  

(8)

In the regression equation (8), there are two explanatory variables: change in Earnings per Share \( \left( \frac{E_2 - E_1}{P_1} \right) \) and change in depreciation, amortization and other irregular expenses \( \left( \frac{A_2 - A_1}{P_1} \right) \). In the non-linear regression, we restricted the slope coefficient \( (\beta) \) which appears in both explanatory variables to equal each other, so that the weight for Earnings per Share \( (w_E) \) can be efficiently estimated by the regression. The advantage of this approach is that it can estimate the optimal weight directly in one single attempt rather than through trial and error with various values of \( w_E \).

6. Regression Result

**Reiterative Approach**

In this empirical research, we proposed two approaches for regressions. The first approach is Reiterative Approach. For this approach, we attempt to find out the optimal weighting for Earnings per Share \( (w_E) \) by regressing the following equation with changing variable \( w \) from 0 to 1 by 0.1 increment:

\[
AR = \alpha + \beta \left( \frac{E_2 - E_1}{P_1} + (1 - w_E) \ast \frac{A_2 - A_1}{P_1} \right)
\]  

(8)
Table 1
Result of Reiterative Approach (0 < \( w_E \) < 1)

<table>
<thead>
<tr>
<th>( w_E ) Value</th>
<th>( \alpha ) (Intercept)</th>
<th>( \beta ) (Slope)</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.219223</td>
<td>6.696280</td>
<td>0.041476</td>
</tr>
<tr>
<td>0.1</td>
<td>0.219009</td>
<td>6.719000</td>
<td>0.049774</td>
</tr>
<tr>
<td>0.2</td>
<td>0.218697</td>
<td>6.745700</td>
<td>0.059967</td>
</tr>
<tr>
<td>0.3</td>
<td>0.218255</td>
<td>6.776200</td>
<td>0.072224</td>
</tr>
<tr>
<td>0.4</td>
<td>0.217654</td>
<td>6.809010</td>
<td>0.086345</td>
</tr>
<tr>
<td>0.5</td>
<td>0.216884</td>
<td>6.840380</td>
<td>0.101375</td>
</tr>
<tr>
<td>0.6</td>
<td>0.215983</td>
<td>6.863570</td>
<td>0.115248</td>
</tr>
<tr>
<td>0.7</td>
<td>0.215064</td>
<td>6.870150</td>
<td>0.124972</td>
</tr>
<tr>
<td>0.8</td>
<td>0.214292</td>
<td>6.854450</td>
<td>0.127839</td>
</tr>
<tr>
<td>0.9</td>
<td>0.213809</td>
<td>6.818450</td>
<td>0.123115</td>
</tr>
<tr>
<td>1</td>
<td>0.213653</td>
<td>6.771140</td>
<td>0.112529</td>
</tr>
</tbody>
</table>

After the first iteration, regression result indicates that \( R^2 \) is maximized with a weight of around 80% for Earnings per Share in the Earnings Index (I) will be optimal for insurance industry. Thus, we regressed the equation again reiteratively in smaller increments from 0.75 to 0.85 to find the optimal weight in a more precise term. The result is summarized in Table 2 below:

Table 2
Result of Reiterative Approach (0.75 < \( w_E \) < 0.85)

<table>
<thead>
<tr>
<th>( w_E ) Value</th>
<th>( \alpha ) (Intercept)</th>
<th>( \beta ) (Slope)</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.75</td>
<td>0.214649</td>
<td>6.865170</td>
<td>0.127370</td>
</tr>
<tr>
<td>0.76</td>
<td>0.214573</td>
<td>6.863480</td>
<td>0.127621</td>
</tr>
<tr>
<td>0.77</td>
<td>0.214498</td>
<td>6.861560</td>
<td>0.127794</td>
</tr>
<tr>
<td>0.78</td>
<td>0.214427</td>
<td>6.859410</td>
<td>0.127887</td>
</tr>
<tr>
<td>0.79</td>
<td>0.214358</td>
<td>6.857040</td>
<td>0.127902</td>
</tr>
<tr>
<td>0.8</td>
<td>0.214292</td>
<td>6.854450</td>
<td>0.127839</td>
</tr>
<tr>
<td>0.81</td>
<td>0.214229</td>
<td>6.851660</td>
<td>0.127697</td>
</tr>
<tr>
<td>0.82</td>
<td>0.214169</td>
<td>6.848660</td>
<td>0.127477</td>
</tr>
<tr>
<td>0.83</td>
<td>0.214113</td>
<td>6.845470</td>
<td>0.127182</td>
</tr>
<tr>
<td>0.84</td>
<td>0.214059</td>
<td>6.842090</td>
<td>0.126811</td>
</tr>
<tr>
<td>0.85</td>
<td>0.214009</td>
<td>6.838540</td>
<td>0.126367</td>
</tr>
</tbody>
</table>
From the above result, we note that the optimal weighting for Earnings per Share to apply in the Earnings Index (I) is 0.79 or 79% in more precise terms.

**Non-linear Regression with Restricted Coefficient Approach**

An alternative method to estimate the weight is the restricted coefficient approach which allow us to estimate the optimal weight directly without trial and error.

Eq. (8) can be expressed as (9):

\[
AR = \alpha + \beta X_1 + \beta \ast (1 - w_E) \ast X_2 \quad (9)
\]

where \(X_1 = \frac{E_2 - E_1}{P_1}\) and \(X_2 = \frac{A_2 - A_1}{P_1}\).

Eq. (9) can be regressed with non-linear least square method with restricted value of coefficient \(\beta\) where the coefficient for \(X_1\) is the same as the coefficient of \(X_2\). Unlike reiterative approach, the value of \(w_E\) is estimated jointly with coefficient \(\beta\), rather than being set at various levels.

**Table 3**

Result of Non-linear Regression with Restricted Coefficient Approach

<table>
<thead>
<tr>
<th>(\alpha) (Intercept)</th>
<th>(\beta) (Slope)</th>
<th>(w_E) (Weight)</th>
<th>(R^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient</td>
<td>T-stat</td>
<td>Coefficient</td>
<td>T-Stat</td>
</tr>
<tr>
<td>0.214379</td>
<td>6.798410</td>
<td>0.919437</td>
<td>3.038230</td>
</tr>
</tbody>
</table>

From the above result, it is suggested that the optimal weighting for Earnings per Share to apply in the Earnings Index (I) is 0.786895 or 78.6895%, which is approximately 79% and the optimal weight for Cash Flow per Share to apply in the Earnings Index (I) is \((1 - 0.786895) = 0.213105\) or 21%. As seen, the two proposed approaches yielded similar results.

The results for all three metrics are summarized in Table 4 below:

**Table 4**

Explanatory Power of All Three Metrics

<table>
<thead>
<tr>
<th>Metrics</th>
<th>(w_E) Value</th>
<th>(R^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash Flow per Share (C)</td>
<td>0</td>
<td>0.041476</td>
</tr>
<tr>
<td>Composite Earnings Index (I)</td>
<td><strong>0.79</strong></td>
<td><strong>0.127906</strong></td>
</tr>
<tr>
<td>Earnings per Share (E)</td>
<td>1</td>
<td>0.112529</td>
</tr>
</tbody>
</table>

Note that the use of a composite index, as compared to the use of either accounting earnings or cash flow alone, increase R-square by 13.67% and more than 208.38% respectively. Thus, the
index as shown in Table 4 has greater explanatory power than both the earnings and cash flow metrics.

7. Conclusion

The objective of the paper is to find an optimal composite index that yields the strongest correlation with stock return so that it can be used to evaluate performance of insurance companies. The index has been shown to have greater explanatory power than both the earnings and cash flow metrics. This implies that analysts using an earnings composite approach will be able to value stocks more accurately than using either accounting earnings or cash flows alone. Furthermore, an analyst who uses the index to forecast might better predict stock return than analysts who use other conventional earnings measure. This can also help the managers of insurance companies to better manage their cash flows in order to maximize the value of the firm for shareholders.

Bibliography


