Introduction to Eva Method and Corporate Valuation - taking Tsingtao Brewery as an Example

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Abstract. EVA (Economic Value Added) method, namely the performance evaluation method of Economic Value Added, is a method of business performance proposed in view of the defects of traditional accounting profits. The advantage of EVA method is that it reflects the value-added income obtained by shareholders from business activities. Generally speaking, EVA is equal to the balance of the enterprise's after-tax profit after deducting the cost of equity capital and debt invested. Taking tsingtao beer as an example, this paper analyzes the enterprise valuation by EVA method.

1. Introduction

The EVA (Economic Value Added) method can be expressed by the formula:

$$EVA = R - C \times WACC$$  \hspace{1cm} (1)

Where R is the adjusted after-tax profit, C is the invested capital, and WACC is the weighted average cost of capital expressed as a fraction.

Enterprise value can be considered as the sum of the present value of the future EVA, namely:

$$V = \sum_{i=1}^{n} \frac{EVA_i}{(1+WACC)^i}$$  \hspace{1cm} (2)

Among them $EVA_i$ represents the EVA value of the i-th year.

2. Empirical Analysis of Eva's Valuation: Taking Tsingtao Brewery as an Example

This article uses Tsingtao Brewery as an example to introduce the principle, calculation process and limitations of the EVA method in company valuation. The parameters are estimated as follows.

2.1. Adjusted profit after tax R

Since interest expenses are already included in the cost of debt invested by the enterprise, the interest expenses need to be added back in the calculation of profits to avoid secondary deductions.

$$R = R_0 + FC - FC \times r = R_0 + FC \times (1 - r)$$  \hspace{1cm} (3)

Where $R_0$ is the net profit after deducting non-recurring profits and losses, FC is the financial expense (interest expense), and R is the income tax rate.
### Table 1. Adjusted after-tax profit of Tsingtao Brewery's debt from 2014 to 2018 (10,000 yuan)

| Years | 2014   | 2015   | 2016   | 2017   | 2018   |
|-------|--------|--------|--------|--------|--------|
| Ro Net profit after deducting non-recurring gains and losses | 167,141 | 105,271 | 81,940 | 97,527 | 105,374 |
| FC financial costs | 33,465 | 29,960 | 25,741 | 37,002 | 49,712 |
| r Income tax rate | 25% | 25% | 25% | 25% | 25% |
| R Adjusted profit after tax | 192,240 | 127,741 | 101,246 | 125,279 | 142,658 |

2.2. Weighted average cost of capital WACC

Weighted average cost of capital is a method of calculating the cost of capital for a company, where each type of capital is weighted proportionally. All sources of capital, including common stock, preferred stock, bonds and other long-term debt, are included in the weighted average cost of capital. In calculation, the calculation formula is:

\[
WACC = \frac{E}{D+E} \times K_E + \frac{D}{D+E} \times K_D
\]

Where E is the value of equity and D is the value of debt, \( K_E \) is the cost of capital for equity, \( K_D \) is the cost of capital for debt.

1. Cost of equity capital \( K_E \):

Cost of capital \( K_E \). The calculation should follow the capital asset pricing model:

\[
K_E = R_f + \beta(R_m - R_f)
\]

Where: \( R_f \) Represents a risk-free rate, \( \beta \) Represents the risk factor of the stock, \( R_m \) Represents the market's expected return on stocks; \( R_m - R_f \) represents a risk premium.

\( \beta \) is a measure of the systemic risk of a security or portfolio relative to the overall market. It is widely used in portfolio theory, namely capital asset pricing model (CAPM) and securities market line (SML). \( \beta \) means that the return volatility of a given security is higher or lower than the market return volatility. \( \beta \) values below 1 indicate that the volatility of the security or portfolio is lower than the market, volatility, or that the volatility is not highly correlated with the market. Treasury bonds, for example, don't go up or down much, so their beta is low; While the price of gold has a lot of ups and downs, but with the direction of the market or the timing. \( \beta \) greater than 1 usually means the asset is highly volatile and fluctuates with the market. When the market goes up and some stocks tend to go down, there may be negative \( \beta \), and vice versa.

For a particular security or portfolio, its coefficient can be expressed as

\[
\beta = \frac{\text{Cov}(R_a,R_m)}{\sigma_m^2}
\]

\( R_a \) is the average yield of the company's securities, \( R_m \) is the daily average market rate of return, \( \text{Cov}(R_a,R_m) \) is the covariance between the return of the security and the return of the market, \( \sigma_m^2 \) is the variance of market returns.

The daily rate of return of Tsingtao Brewery Company from 2014 to 2018 was collected through the Guotai'an database. The average rate of return on all trading days each year is \( R_a \). Market yield \( R_m \) is usually replaced by the average daily return of the Shanghai Stock Index over the same period. \( R_m \) calculate the variance of available market returns \( \sigma_m^2 \) and covariance \( \text{Cov}(R_a,R_m) \). From this, we can get the Qingdao Beer Company's 2014-2018 \( \beta \). The values are shown in the following table:
Table 2. Tsingtao Brewery’s 2014-2018 β coefficient

| Years | 2014  | 2015  | 2016  | 2017  | 2018  |
|-------|-------|-------|-------|-------|-------|
| $R_a$ Company average rate of return | -0.0549% | -0.0518% | -0.0384% | 0.1310% | -0.0169% |
| $R_m$ Daily average market expected yield | 0.1792% | 0.0671% | -0.0431% | 0.0275% | -0.1023% |
| $\sigma_m$ Market yield variance | 0.0117% | 0.0596% | 0.0210% | 0.0030% | 0.0152% |
| $\text{Cov}(R_a, R_m)$ Covariance of security returns and market returns | 0.0064% | 0.0542% | 0.0160% | 0.0032% | 0.0169% |
| $\beta$ | 0.5470 | 0.9094 | 0.7619 | 1.0667 |

If the risk-free interest rate $R_f$ is further determined, the capital cost of $K_E$ equity can be calculated by CAPM model. $R_f$ is expressed by Shanghai interbank offered rate (SHIBOR). The market expected rate of return $R_m$ is based on the SSE composite index in each year. After the expected rate of return (highest index - lowest index)/highest index is obtained, the expected rate of return of the daily chemical market is obtained by dividing by the square root of the number of trading days per year, namely $\sqrt{246}$. The value is as follows:

Table 3. $K_E$ of Tsingtao Brewery 2014-2018

| Years | 2014 | 2015 | 2016 | 2017 | 2018 |
|-------|------|------|------|------|------|
| $R_f$ Risk-free interest rate | 2.7724% | 2.0081% | 2.0748% | 2.6266% | 2.4872% |
| $\beta$ | 0.5470 | 0.9094 | 0.7619 | 1.0667 | 1.1118 |
| The lowest value of the Shanghai Composite Index | 1974.382 | 2850.714 | 2638.302 | 3016.53 | 2449.197 |
| The highest value of the Shanghai Composite Index | 3239.357 | 5178.191 | 3538.689 | 3450.495 | 3587.032 |
| Market Expected Yield | 64.0694% | 81.6454% | 34.1275% | 14.3862% | 46.4575% |
| $R_m$ Expected return on daily chemical market | 4.0849% | 5.2055% | 2.1759% | 0.9172% | 2.9620% |
| $K_E$ Cost of equity capital | 3.49% | 4.92% | 2.15% | 0.80% | 3.02% |

2. Cost of debt capital $K_D$

The cost of debt capital refers to the cost of borrowing or issuing bonds, including the cost of borrowing and bond interest. This article uses the benchmark deposit and loan interest rate set by the People's Bank of China as the cost of debt capital.

Tsingtao Brewery's debt capital can be divided into short-term debt capital and long-term debt capital. The capital cost of short-term debt is determined at a benchmark interest rate of deposits and loans within one year (including one year), and the capital cost of long-term debt ranges from one to five years. The benchmark interest rate for deposits and loans is determined. However, since Tsingtao Brewery Co., Ltd. mainly has short-term debt capital and long-term debt capital is negligible, the cost of short-term debt capital can be regarded as the total cost of debt capital. Cost of capital $K_D$ They are 6%, 4.85%, 4.85%, 4.85%, and 4.35%.
3. Weighted average cost of capital WACC

| Years | 2014          | 2015          | 2016          | 2017          | 2018          |
|-------|---------------|---------------|---------------|---------------|---------------|
| D Liabilities | 1,171,663     | 1,233,458     | 1,319,802     | 1,320,020     | 1,538,531     |
| E Equity     | 1,528,728     | 1,616,601     | 1,687,914     | 1,777,450     | 1,868,995     |
| D + E total capital | 2,700,391 | 2,850,059 | 3,007,716 | 3,097,471 | 3,407,526 |
| K_E Cost of equity capital | 3.49% | 4.92% | 2.15% | 0.80% | 3.02% |
| K_D Cost of debt capital | 6% | 4.85% | 4.85% | 4.85% | 4.35% |
| WACC weighted average cost of capital | 4.58% | 4.89% | 3.33% | 2.53% | 3.62% |

3.1. Invested capital C

Invested capital is the sum of debt capital and equity capital. Debt capital is considered as the sum of short-term debt, bills payable, accounts payable, and non-current liabilities due within one year among short-term liabilities; equity capital is considered as paid-in capital and capital. The sum of the product compared with the previous year (with the zero limit as the lower limit). Therefore, the value of the invested capital C from 2014 to 2018 is shown in the following table.

| Years | 2014    | 2015    | 2016    | 2017    | 2018       |
|-------|---------|---------|---------|---------|------------|
| Debt capital | 811,240 | 856,547 | 889,990 | 901,876 | 1,022,028 |
| Equity capital | 61      | 0       | 0       | 0       | 1          |
| C Invested capital | 811,301 | 856,547 | 889,990 | 901,876 | 1,022,029 |

4. Calculation of EVA results and company valuation

Based on the formula EVA = R - C * WACC, the predicted value and company value of EVA in 2014-2018 and 2019-2023 can be obtained:

| Years | 2014    | 2015    | 2016    | 2017    | 2018       |
|-------|---------|---------|---------|---------|------------|
| R Adjusted profit after tax | 192,240 | 127,741 | 101,246 | 125,279 | 142,658 |
| C Invested capital | 811,301 | 856,547 | 889,990 | 901,876 | 1,022,029 |
| WACC weighted average cost of capital | 4.58% | 4.89% | 3.33% | 2.53% | 3.62% |
| EVA | 155082 | 85,649 | 81,579 | 71,533 | 3158 |
| Annual growth rate | -44.64% | -16.59% | 43.08% | 3.12% |
| Average growth rate | -3.76% |

| Years | 2019    | 2020    | 2021    | 2022    | 2023       | stable period |
|-------|---------|---------|---------|---------|------------|---------------|
| EVA | 101,688 | 97,864 | 94,184 | 90,643 | 87,235     | 87,235         |
| Present value coefficient | 0.95 | 0.91 | 0.92 | 0.90 | 0.82 | 0.0362 |
| Present value | 96604 | 89056 | 86649 | 81579 | 71533 | 3158 |
| V Company value | 428578 |
5. Conclusions

1. EVA is calculated based on historical data. The data is lagging, and it is impossible to predict the improvement or deterioration of future operating conditions.
2. The calculation of EVA is subjective, and the numerical calculation of various indicators is related to the selection of data by accountants.
3. EVA is calculated based on the balance sheet and income statement, failing to take into account the impact of non-financial information.

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