Mathematic Modelling of the Integrated Application of The Magic Formula and The Acquirers Multiple and Additional Factors for Stock Rating

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1) Calculating Acquirers Multiple and ROCE, EY (Constituents of the Magic Formula):

$$AM_i = \frac{EV_i}{EBIT_i}$$

$$ROCE_i = \frac{EBIT_i}{(Capital\ Employed)_i}$$

$$EY_i = \frac{EPS_i}{Share\ Price_{\ i}}$$

$$RG_i = \left(\frac{Revenue_{Year3}}{Revenue_{Year0}}^{1/3}\right) - 1$$

$$FCFG_i = \left(\frac{FCF_{Year3}}{FCF_{Year0}}^{1/3}\right) - 1$$

$$DE_i = \frac{Total\ Debt}{Shareholders\ Equity}$$

Where:

1. AM_i is the acquirers multiple for stock i
2. $ROCE_i$ is the return on capital employed for stock i
3. EY_i is the earnings yield of stock i
4. $(Capital\ Employed)_i = (Total\ Assets)_i - (Current\ Liabilities)_i$
5. $EPS_i = \frac{(Net\ Income)_i - (Preffered\ Dividends)_i}{Weighted\ average\ number\ of\ shares\ outstanding}$
6. RG_i *is the revenue growth across three years for stock i*
7. $FCFG_i$ *is the FCF growth across three years for stock i*
8. FCF = OCF – Capex
9. DE_i = Debt to Equity for stock i
10. Shareholders' Equity=Total Assets−Total Liabilities

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2) Normalizing the calculated values using Z-Score Normalization:

$$Z_{AM_i} = \frac{AM_i - \mu_{AM}}{\sigma_{AM}}$$

$$Z_{ROCE_i} = \frac{ROCE_i - \mu_{ROCE}}{\sigma_{ROCE}}$$

$$Z_{EY_i} = \frac{EY_i - \mu_{EY}}{\sigma_{EY}}$$

$$Z_{RG_i} = \frac{RG_i - \mu_{RG}}{\sigma_{RG}}$$

$$Z_{FCFG_i} = \frac{FCFG_i - \mu_{FCFG}}{\sigma_{FCG}}$$

$$Z_{DE_i} = \frac{DE_i - \mu_{DE}}{\sigma_{DE}}$$

$$Z_{B_i} = \frac{\beta_i - \mu_\beta}{\sigma_\beta}$$

Where:

1. Z_{x_i} *is the normalized* x *score* where x *is*:
   a. AM
   b. ROCE
   c. EY
   d. RG
   e. FCFG
   f. DE
   g. β

2. μ_x *is the average* x *score of stocks in the same industry where* x *is*:
   a. AM
   b. ROCE
   c. EY
   d. RG
   e. FCFG
   f. DE
   g. β

3. σ_x *is the standard deviation of* x *scores of stocks in the same industry where* x *is*:
   a. AM

b. ROCE
c. EY
d. RG
e. FCFG
f. DE
g. β

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3) Converting to Score (Scoring on [0,1] ensuring outliers are smoothed)

$$Score_{AM_i} = 1 - Sigmoid(Z_{AM_i})$$
$$Score_{DE_i} = 1 - Sigmoid(Z_{DE_i})$$
$$Score_{\beta_i} = 1 - Sigmoid(Z_{\beta_i})$$
$$Score_{ROCE_i} = Sigmoid(Z_{ROCE_i})$$
$$Score_{EY_i} = Sigmoid(Z_{EY_i})$$
$$Score_{RG_i} = Sigmoid(Z_{RG_i})$$
$$Score_{FCFG_i} = Sigmoid(Z_{FCFG_i})$$

Where:

1. $Sigmoid(x) = \frac{1}{1+e^{-x}}$

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4) Output Weighted Composite Score:

$$FinalScore_i = (w_1 * Score_{AM_i}) + (w_2 * Score_{ROCE_i}) + (w_3 * Score_{EY_i}) + \\ +(w_5 * Score_{DE_i}) + (w_6 * Score_{\beta_i}) + (w_7 * Score_{RG_i}) + (w_4 * Score_{FCFG_i})$$

Where:

1. $w_1 = 0.25$
2. $w_2 = 0.125$
3. $w_3 = 0.125$
4. $w_4 = 0.2$
5. $w_5 = 0.1$
6. $w_6 = 0.15$
7. $w_7 = 0.05$

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5) Output Final Rating

$$FinalRating_i = 100 * FinalScore_i$$