On the Models to Evaluate a Merger/Acquisition Project

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Abstract

We compare and contrast the existing merger/acquisition evaluation models and based on the results, propose a model that is more complete. The model emphasizes on the need to value not only the target firm, but also the acquiring firm such that 1) the increase in debt capacity for each firm due to the coinsurance benefit that stems from the diversification effect by pooling two firms together can be considered and 2) the synergy gains accrued to each firm can be valued by the firm's own discount rate. The model provides methods to account for the effect of the increased debt capacity on the valuations.

I. Introduction

Corporate mergers/acquisitions are common in the business world; thus, the models to evaluate a merger/acquisition project are widely discussed. The main task in the evaluation is to value the acquiring and the target firms. There are two broad categories of valuation methods: the discounted cash flow (DCF) and the market multiple methods. Between them, the former appears to be the mainstream. In this study, we focus on the DCF method.

To find the merger/acquisition evaluation models, we do a comprehensive search on Amazon.com for textbooks related to 1) financial management, 2) corporate finance, and 3) merger and acquisition valuations. The result is a list that includes the books used in this study plus others listed in Appendix A. The appendix also explains why these books are not included in the study.

We specify the main features in each model to facilitate analysis. From the analysis, we find that within the DCF method, the authors use divers approaches, leaving some clarifications desirable, and in our opinion, the models are incomplete. We then propose our model. The model emphasizes on the need to value not only the target firm, but also the acquiring firm such that 1) the increase in debt capacity for each firm due to the coinsurance benefit that stems from the diversification effect by pooling two firms together can be considered and 2) the synergy gains accrued to each firm can be valued by the firm's own discount rate. The model also provides methods to account for the effect of the increased debt capacity on the discount rate for the valuation.

Section II reviews the models and list their main features. Based on the results, we offer some discussions in Section III. In Section IV, we lay out what a more complete model should be based on the discussions. Section V concludes this paper.

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II. Review on Existing Evaluation Models

Before we discuss the evaluation models for mergers/acquisitions, a brief review on the DCF valuation method is in order. The method involves 4 common steps for all its variants.

Step 1:
Estimate the annual free cash flows (FCF's) for the next N years.

Step 2:
Based on the FCF for year N, estimate the horizon value (HV), which is the present value at time N of all the FCF's beyond year N.

Step 3:
Add the HV to year N's FCF.

Step 4:
Find the present value of all the N cash flows.

This four-step procedure is applied in three variants.
1. The corporate valuation method
    In this method, the free cash flows are those generated from the firm's operations, and the resulting present value from Step 4 would be the total value of the firm.[1] The discount rate used to find the present value is the weighted average cost of capital, WACC.

$$WACC = W_D R_D (1 - T) + W_S R_S \qquad (1)$$

In this equation, the W's represent the chosen weights of debt (D) and equity (S), R's are the costs to the firm of each type of financing, and T represents the tax rate. Let $V=D+S$; thus, $W_D = \frac{D}{V}$. W_D is called the "debt ratio." WACC assumes that the firm will continuously rebalance its debt to maintain a constant debt ratio. Subtracting the market value of the debt from the total value of the firm, one obtains the total value of the equity.
2. The equity free cash flow method
    In this method, the free cash flows are those that flow to the equity-holders and the resulting present value from Step 4 would be the total value of the equity. The discount rate used to find the present value is the cost of equity (either levered or unlevered, depending on whether the firm is levered or not). The cost of equity, R_S, is determined by the capital asset pricing model (CAPM),

$$R_S = R_F + (R_M - R_F)\beta_S. \qquad (2)$$

In this equation, R_F is the risk-free rate, R_M is the expected rate of return of the market portfolio, $(R_M - R_F)$ is the equity market risk premium, and β_S is the market risk of the equity.

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[1] Assume the firm has no non-operating assets for simplicity. Otherwise the total value of the non-operating assets should be added to the present value from Step 4 to find the total value of the firm.

3. The adjusted present value method
In this method, there are two streams of cash flows, and the aforementioned four-step procedure is applied to each stream. The first is the same as in the corporate valuation method above, the free cash flows from the firm's operations. The second is the tax shields. The two present values from Step 4 are then added together to find the adjusted present value. The discount rate for both streams is the firm's unlevered cost of equity if the firm will maintain a constant debt ratio, otherwise the discount rate for the second stream would be the cost of debt. Subtracting the market value of the debt from the adjusted present value, one obtains the total value of the equity. The cost of unlevered equity, R_A, is also determined by the CAPM,

$$R_A = R_F + (R_M - R_F)\beta_A. \qquad (3)$$

In this equation, β_A is the market risk of the unlevered equity. The unlevered cost of equity is also equal to the weighted average of the cost of debt and cost of equity.

$$R_A = W_D R_D + W_S R_S \qquad (3a)$$

We review the evaluation models for mergers/acquisitions found in finance textbooks and specify their respective main features in the following.

Berk and DeMarzo (2020)
The model uses the adjusted present value method. It values the target firm only, including all synergy gains. It is not concerned with debt ratio and instead, uses a pre-determined debt schedule to calculate the tax shields. The total cost of the acquisition (including the cost paid to acquire the target firm) is subtracted from the adjusted present value to arrive at the net present value (NPV) of the merger project.

Brealey, Myers, and Allen (2020)
Two models are presented. One uses the corporate valuation method and the other the adjusted present value method. In the former, the target firm will maintain the pre-merger debt ratio into the future. In the latter, the target firm will have a pre-determined debt schedule. Synergy gains are not included in the valuations. Let PV_A be the stand-alone value of the acquiring firm and PV_B of the target firm. Let PV_{AB} be the value of the merged firm, including all synergy gains. The total synergy gain is equal to $PV_{AB}-(PV_A+PV_B)$. Let C be the cost paid to acquire the target firm. The net cost of the acquisition is equal to $C-PV_B$. The NPV of the merger project is equal to the total synergy gain minus the net cost of the acquisition.

$$NPV = PV_{AB} - (PV_A + PV_B) - (C - PV_B) = PV_{AB} - PV_A - C$$

Oddly, the authors do not explain how to estimate PV_{AB}. They also do not explain if synergy gains are not included, why it is necessary to estimate PV_A and PV_B.

Brigham and Ehrhardt (2020)
The model uses the adjusted present value method. It values the target firm only, taking into account all synergy gains. After the merger, the debt will be adjusted annually to maintain a

constant debt ratio. Subtracting the pre-merger debt from the adjusted present value results in the value of the equity. The NPV of the merger project is equal to this value minus the pre-merger equity value. Although the model assumes a constant capital structure, the authors point out that after the merger, the firm usually has a non-constant capital structure during the N-year post-merger valuation period (in Step 1); therefore, the adjusted present value method is more appropriate than others.

Brigham and Houston (2019)
The model uses equity free cash flow method. It values the target firm only, including all synergy gains. The authors point out that in a merger, the acquiring firm often assumes the target firm's existing debt, and the debt the acquiring firm structures to finance the merger would thus have two components: the debt assumed and any new debt obtained. Because the debt assumed and the new debt usually have differing interest rates, it is more appropriate to calculate the interest expenses for each year during the N-year post-merger valuation period to find the free cash flows. Thus, the authors prefer to use the equity free cash flow method to value the target firm instead of the corporate valuation method.[2] Nevertheless, the model still assumes that the target firm will be able to maintain a constant debt ratio that is the same as its pre-merger debt ratio. Therefore, the discount rate for the free cash flows is the pre-merger cost of equity. The NPV of the merger project is equal to the equity value (from Step 4) minus the pre-merger equity value.

Emery, Finnerty, and Stowe (2018)
The model uses corporate valuation method. It values the target firm only, including all synergy gains. Instead of the WACC described above, the model uses a weighted average cost of capital developed by Miles and Ezzell (1980), which assumes annual debt rebalancing.[3] The NPV of the merger project is equal to the total value of the target firm minus the total acquisition cost (including the cost paid to acquire the target firm).

Arzac (2008)
The model uses the corporate valuation method. It values the acquiring and the target firms separately using their respective WACC. Each firm includes the synergy gains accrued to it. Each firm has its own target debt ratio. The author doesn't mention whether the target debt ratio is the same as the firm's pre-merger debt ratio. Nor does he mention whether the R's in the WACC are pre-merger ones or estimated based on the target debt ratio if the target debt ratio is different from the pre-merger one. The total value of the firm minus the value of the firm's existing debt is equal to the value of the equity. The estimated stock price per share is equal to this value divided by the number of shares outstanding. The author does not calculate the NPV of the merger project, but mentions that the project would be beneficial to the acquiring firm as long as the price per share offered to the target firm's shareholders is less than the estimated stock price. For the acquiring

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[2] In the corporate valuation method, the interest expenses is not included in the calculation of the free cash flow. Instead, the cost of debt is accounted for by the discount rate, WACC. If the firm has multiple debts with differing interest rates, it is difficult to determine the value for the cost of debt, R_D, in the WACC.

[3] The Miles and Ezzell (1980) weighted average cost of capital is shown in the following,

$$WACC^* = R_A - LR_D T^* \left(\frac{1+R_A}{1+R_D}\right).$$

In this equation, R_A is the unlevered cost of equity, L is the debt ratio, R_D is the cost of debt, and T^* is the net-benefit-to-leverage factor. Emery, Finnerty, and Stowe (2018) however, do not explain what T^* means and how to obtain its value. In Miles and Ezzell (1980), it is the firm's income tax rate.

firm, the estimated stock price is lower than the pre-merger price; the possible explanation offered by the author is that the market has impounded a higher growth rate for the firm than assumed by the model, but the author doesn't explain how this difference plays a role in making the decision for the merger project.

Grinblatt and Titman (1998)
The model uses the equity free cash flow method. Only the target firm is valued, including the synergy gains accrued to it. The synergy gains accrued to the acquiring firm are value separately using the acquiring firm's cost of equity.[4] The results of these two valuations are then added together to obtain the total value. The authors do not calculate the NPV of the merger project, but mention that if the total value is higher than the target's pre-merger equity value, the project should be pursued.

III. Discussions

If the post-merger debt ratio can't be kept constant, one should use the equity free cash flow or the adjusted present value method to specify the interest expenses for each year during the N-year post-merger valuation period. However, for the equity free cash flow method, it would be difficult to determine the cost of equity, R_S, because strictly speaking, R_S should be changing from year to year during this period, depending on the debt ratio in each year. In the adjusted present value method, the discount rate for the free cash flows is the unlevered cost of equity, which stays the same over time regardless of the debt ratio. Therefore, if the debt ratio cannot be kept constant post-merger, the adjusted present value method is preferred.

Except Arzac (2008), the models discussed in this study only value the target firm. In Arzac (2008), the estimated stock price for the acquiring firm is lower than the pre-merger price, implying the possibility of negative synergy gains for the firm. It may be more robust if both firms are valued such that each firm can include the synergy gains accrued to it and the gains can be valued by the firm's own discount rate. If only the target firm is valued, the synergy gains for both firms would be lumped together and valued at the target firm's cost of capital. This is problematic if the firms have different discount rates, which is especially likely to happen if the merger is a conglomerate one. In Grinblatt and Titman (1998), although only the target firm is valued, the synergy gains accrued to the acquiring firm are valued separately.

Most of the models assume a constant debt ratio post-merger and the debt ratio is the same as the pre-merger one. The literature posits that at least in theory, WACC should be based on the firm's target debt ratio, instead of the current debt ratio; that is, W_D in Equation (1) should be the target debt ratio, implying that the R's in the equation should also be based on the target debt ratio.

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[4] The authors offer a hypothetical example for this treatment. Hilton Hotels is considering acquiring a German hotel chain, Welch Hotels. After the merger, Welch will have a higher occupation rate due to Hilton's reputation and its worldwide reservation network. This stream of gains would have the same discount rate as Welch's original cash flows because they all are subject to the state of the German economy. Hilton will also benefit from the merger; the presence in Germany results in more German people coming into contact with the Hilton name, which increases the likelihood that these people will choose Hilton hotels when they travel outside Germany. The increased cash flows are determined by the demand for Hilton's hotels outside Germany; therefore, they should have a discount rate that is the same as the firm's original cash flows.

Therefore, to value the acquiring and the target firms, the WACC for each firm should be based on the firm's post-merger target debt ratio. The determination of this ratio should take into account the increased debt capacity due to the co-insurance effect from the merger. Unless the operating cash flows of both firms are perfectly correlated, the merger creates diversification effect that results in coinsurance benefit for both firms' debts and in turn, raises their debt capacities.[5] It means that both firms can afford to pursue a higher target debt ratio. Empirical results have indicated that post-merger firms have more debt capacity than the combined total for the pre-merger firms (Kim and McConnell (1977)). A higher target debt ratio decreases the firm's WACC and raises the value of the firm. None of the models reviewed in this study take into account these effects. In Arzac (2008), the acquiring and the target firm each has its own post-merger target debt ratio; however, it doesn't say whether this ratio is the same as the pre-merger debt ratio, nor does it mention the coinsurance effect.

Based on the analysis above, we believe that a complete evaluation model for merger/acquisition should contain the following elements:

1. It values both the acquiring and the target firm;
2. It estimates the synergy gain accrued to each firm separately;
3. The synergy gain accrued to each firm is calculated using the firm's own discount rate;
4. It uses the post-merger target debt ratio of the firm 1) to estimate the costs of debt and equity and thus the WACC for the corporate valuation method; 2) to estimate the cost of equity for the equity free cash flow method, and 3) to construct the debt schedule to estimate tax shields for the adjusted present value method. The post-merger target debt ratio should take into account the increased debt capacity due to the coinsurance effect from the merger;
5. For the corporate valuation method, it provides an academically accepted methodology to estimate the costs of debt and equity (and thus the WACC) if the post-merger target debt ratio differs from the existing one. The methodology obeys the constraint that the unlevered cost of equity (R_A in Equation (3a)) stays the same after the change in debt ratio unless there is a change in the firm's asset pool.
6. For the equity free cash flow method, it provides an academically accepted methodology to estimate the cost of equity if the post-merger target debt ratio differs from the existing one. It points out that although the cost of debt is not needed in the model, it should be estimated based on the post-merger target debt ratio. Then the resulting costs of equity and debt should be used to calculate the post-merger R_A based on Equation (3a) to make sure it is equal to the pre-merger R_A to obey the constraint mentioned above. If not, adjustments should be made.

Based on these elements, we point out the deficiencies of each evaluation model reviewed in this study in Appendix B.

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[5] In a perfect market, corporate diversification does not add value because investors can diversify on their own. However, if imperfections exist, such as corporate taxations, corporate diversification increases debt capacity and potentially raises frim value due to increased interest tax shields stemming from the increased debt capacity.

IV. Our Proposal

In our model, the acquiring and the target firms are valued separately. Each firm's free cash flows include the synergy gains accrued to it. For the corporate valuation method, based on Equation (1), we specify the pre- and the post-merger WACC's in the following.

$$WACC^{Pre} = W_D^{Pre} R_D^{Pre}(1 - T) + W_S^{Pre} R_S^{Pre} \tag{4}$$

$$WACC^{Post} = W_D^{Post} R_D^{Post}(1 - T) + W_S^{Post} R_S^{Post} \tag{5}$$

In Equation (4), all values for the variables are pre-merger and in Equation (5), post-merger. Assume that T stays the same. If the post-merger target debt ratio is the same as the pre-merger debt ratio, $WACC^{Post} = WACC^{Pre}$. That is, $WACC^{Pre}$ can be used to discount the free cash flows and there is no need to estimate $WACC^{Post}$. If the post-merger target debt ratio is not the same as the pre-merger debt ratio due to increased debt capacity or any other reason, $WACC^{Post}$ can be obtained by the following procedure.[6]

1) Calculate the firm's unlevered cost of equity, R_A, using the firm's R_D^{Pre}, R_S^{Pre}, and W_D^{Pre}. Notice that $W_S^{Pre} = 1 - W_D^{Pre}$.

$$R_A = W_D^{Pre} R_D^{Pre} + W_S^{Pre} R_S^{Pre} \tag{6}$$

2) Based on the post-merger target debt ratio, W_D^{Post}, estimate R_D^{Post}.[7]
3) Based on W_D^{Post}, R_D^{Post}, and R_A, calculate R_S^{Post}.
4) Based on W_D^{Post}, R_D^{Post}, R_S^{Post}, and T, calculate $WACC^{Post}$.

This procedure is applied to the acquiring and the target firms to obtain the discount rates to calculate the total values of the firms respectively. WACC assumes that the firm will have a constant debt ratio that is also the target debt ratio, or at least, "will move over time toward the target debt ratio." If this assumption is not valid, one should simply use the adjusted present value method.

Subtracting the market value of the debt from the total value of the firm, one obtains the total value of the equity. Let S_A^{Post} be the acquiring firm's post-merger total value of equity and S_T^{Post} the target firm's. Let S_A^{Pre} be the acquiring firm's pre-merger total value of equity and S_T^{Pre} the target firm's. Let NC be the net acquisition cost. The NPV of the merger project is equal to the combined post-merger equity value minus the combined pre-merger equity value and minus the net acquisition cost.

$$NPV = (S_A^{Post} + S_T^{Post}) - (S_A^{Pre} + S_T^{Pre}) - NC \tag{7}$$

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[6] This procedure comes from Chapter 19 in Brealey, Myers, and Allen (2020).

[7] If $W_D^{Post} > W_D^{Pre}$, R_D^{Post} would be higher than R_D^{Pre}, and vice versa. The managers would need to rely on their knowledge and experience in the business to determine W_D^{Post} and thus, R_D^{Post}. Alternatively, they can consult with their bankers. In the example in Chapter 19 in Brealey, Myers, and Allen (2020), R_D^{Post} is assumed to be equal to R_D^{Pre} for simplicity.

For the equity free cash flow method, based on Equation (2), we specify the pre- and the post-merger R_S in the following.

$$R_S^{Pre} = R_F + (R_M - R_F)\beta_S^{Pre} \tag{8}$$

$$R_S^{Post} = R_F + (R_M - R_F)\beta_S^{Post} \tag{9}$$

If the post-merger target debt ratio is the same as the pre-merger debt ratio, $R_S^{Post} = R_S^{Pre}$. That is, R_S^{Pre} can be used to discount the free cash flows and there is no need to estimate R_S^{Post}. If the post-merger target debt ratio is not the same as the pre-merger debt ratio due to increased debt capacity or any other reason, R_S^{Post} can be obtained by the following procedure.

1) Obtain β_S^{Pre} from public sources. It can also be estimated using historical stock price data.
2) Convert β_S^{Pre} into unlevered equity beta, β_A, based on the Hamada model (1972).

$$\beta_A = \beta_S^{Pre}\left[\frac{1}{1+(1-T)\left(\frac{D^{Pre}}{S^{Pre}}\right)}\right] \tag{10}$$

In this equation, D^{Pre} and S^{Pre} are the pre-merger market values of the firm's debt and equity respectively.

3) Let $\left(\frac{D^{Post}}{S^{Post}}\right)$ be the post-merger debt-to-equity ratio based on the post-merger target debt ratio. Based on this debt-to-equity ratio and β_A, calculate the post-merger equity beta, β_S^{Post}, using again, the Hamada model (1972). Assume the tax rate, T, stays the same.
4) Based on β_S^{Post} and Equation (9), calculate R_S^{Post}.

This procedure is applied to the acquiring and the target firms to obtain the discount rates to calculate the equity values of the firms respectively. As pointed out in the previous section, although it is not needed in the model, the cost of debt should also be estimated based on the post-merger target debt ratio. Then the new costs of equity and debt should be used to calculate the post-merger R$_A$ based on Equation (3a) to make sure it is equal to the pre-merger R$_A$. If not, adjustments should be made.

The use of R_S^{Post} assumes that the firm will have a constant debt ratio that is also the target debt ratio, or at least, "will move over time toward the target debt ratio." If this assumption is not valid, one should simply use the adjusted present value method. The NPV of the merger project can be determined by Equation (7).

For the adjusted present value method, the unlevered cost of equity stays the same pre- and post-merger (unless there is a change in the firm's asset pool due to the merger); thus, the pre-merger unlevered cost of equity can be used to discount the free cash flows from the firm's operations. However, the post-merger tax shields would need to be estimated based on post-merger debt schedule. This schedule should take into account the aforementioned change in debt capacity. If, after the adjustments for the debt, the firm is unlikely to have a constant debt ratio after the merger, the discount rate for the tax shields should be the post-merger cost of debt. Subtracting the

value of the debt from the NPV, one obtains the value of the equity. The NPV of the merger project can be determined by Equation (7).

V. Conclusion

Corporate mergers/acquisitions are common in the business world; thus, the models to evaluate a merger/acquisition project are widely discussed. The main task in the evaluation is to value the acquiring and the target firms. There are two broad categories of valuation methods: the discounted cash flow (DCF) and the market multiple methods. In this study, we focus on the DCF method. We collect the evaluation models for mergers/acquisitions from finance textbooks and specify the main features in each model to facilitate analyses. We then propose our model. The model emphasizes on the need to value not only the target firm, but also the acquiring firm such that 1) the increase in debt capacity for each firm due to the coinsurance benefit that stems from the diversification effect by pooling two firms together can be accounted for and 2) the synergy gains accrued to each firm can be valued by the firm's own discount rate. The model provides methods to account for the effect of the increased debt capacity on the discount rate for the valuation.

References

Arzac, Enrique R., "Valuation for Mergers, Buyouts, and Restructuring," Wiley, 2nd edition, 2008.

Berk, Jonathan, and Peter DeMarzo, "Corporate Finance," Person, 5th edition, 2020.

Brealey, Richard A., Stewart C. Myers, and Franklin Allen, "Principles of Corporate Finance," McGraw Hill Education, 13th edition, 2020.

Brigham, Eugene F. and Michael C. Ehrhardt, "Financial Management," Cengage, 16th edition, 2020.

Brigham, Eugene F. and Joel F. Houston, "Fundamentals of Financial Management," Cengage, 15th edition, 2019.

Emery, Douglas R., John D. Finnerty, and John D. Stowe, "Corporate Financial Management," Wohl Publishing, 5th edition, 2018.

Grinblatt, Mark and Sheridan Titman, "Financial Markets and Corporate Strategies," Irwin/McGraw-Hill, 1998.

Kim, E. and J. McConnell, "Corporate Mergers and the Co-insurance of Corporate Debt," Journal of Finance, Vol. XXXII, No. 2, 1977, 349-363.

Miles, J. and J. Ezzell, "The Weighted Average Cost of Capital, Perfect Capital Markets, and Project Life: A Clarification," Journal of Financial and Quantitative Analysis, 15, September 1980, pp. 719-730.

Appendix A

To find the merger/acquisition evaluation models, we did a comprehensive search on Amazon.com for textbooks related to 1) financial management, 2) corporate finance, and 3) merger and acquisition valuations. The result is a list that includes those books used in this study plus the following ones.

1. Block, Stanley B., Geoffrey A. Hirt, and Bartley R. Danielson, "Foundation of Financial Management," McGraw Hill Education, 17th edition, 2019.
2. Ross, Stephen A., Randolph W. Westerfield, and Bradford D. Jordan, "Fundamentals of Corporate Finance," McGraw Hill Education, 12th edition, 2019.
3. Koller, Tim, Mark Goedhart, and David Wessels, "Valuation – Measuring and Managing the Value of Companies," Wiley, 7th edition, 2020.
4. Bacon, Frank, Eun Kang, Min Xu, and Suk kim, "Corporate Financial Management," XanEdu, 4th edition, 2020.
5. Titman, Sheridan, Arthur J. Keown, and John D. Martin, "Financial Management – Principles and Applcations," Pearson, 13th edition, 2019.
6. Petitt, Barbara S. and Kenneth R. Ferris, "Valuation for mergers and Acquisitions," FT Press 2nd edition, 2013.
7. Gaughan, Patrick A., "Mergers, Acquisitions, and Corporate Restructurings," Wiley, 7th edition, 2018.
8. Depampi, Donald M., "Mergers Acquisitions, and other Restructuring Activities," Academic Press, 10th edition, 2019.

Books No. 1 through 4 above contain a merger/acquisition chapter. In the chapter, some topics are discussed but no models are used to value either the acquiring or the target firm. Book No. 5 does not contain a merger/acquisition chapter. These books, therefore, are not mentioned in the study.

Book No. 6 values the target firm only by assuming some numbers as the free cash flows over the valuation period. It does not use either the corporate valuation method, or the equity free cash flow method, or the adjusted present value method to estimate the free cash flows. To discount the free cash flows, it uses the current market data and capital structure to estimate the weighted average cost of capital (WACC) although it mentioned that the estimation should be based on the target capital structure.

Book No. 7 uses the corporate valuation method to value only the target firm. To discount the free cash flows, it uses the current market data and capital structure to estimate the WACC.

Book No. 8 uses the corporate valuation method to value only the target firm. Although it points out that the WACC should be estimated based on the target debt ratio, it uses the current data (thus based on the current capital structure) to estimate the cost of equity. For the cost of debt, it is not clear whether the book uses the current data or estimates based on the target debt ratio.

Compared to the books included in this study, the books above do not add value for the analysis; therefore, they are not included.

Appendix B

Based on the six elements outlined in the Discussions section, we list the deficiencies of each evaluation model reviewed in this study in the following. The numbers of the elements absent from the model are specified under each model.

Berk and DeMarzo (2020)
Elements 1, 2, 3, and 4

Brealey, Myers, and Allen (2020)
Elements 2, 3, 4, and 5

Brigham and Ehrhardt (2020)
Elements 1, 2, and 3

Brigham and Houston (2019)
Elements 1, 2, 3, 4, and 6

Emery, Finnerty, and Stowe (2018)
Elements 1, 2, and 3

Arzac (2008)
Elements 4 and 5

Grinblatt and Titman (1998)
Elements 1, 4, and 6