Valuation Methodologies and Emerging Markets

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Abstract

Correctly applying the valuation methodologies is important. Sabal (2007), using a well-designed example, shows that various methods give identical results, and asserts that APV is more convenient for the emerging market. However, a few issues are questionable which we intend to clarify, including (1) the evidence regarding target debt ratio; (2) the relationship between the WACC/APV and the capital structure; (3) the inconsistencies in the CCF application; and (4) why using the framework by Fernández (2004) does not necessarily prove Sabal’s assertion. Our study and Sabal’s work are both integral parts in contributing to the better understanding of business valuation.

KEYWORDS: WACC, APV, CCF, capital structure

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I. INTRODUCTION

There are a few business valuation methods advocated in academia and widely used in industry. Among them are the weighted average cost of capital (WACC), the adjusted present value (APV), the cash flow to equity (FTE), and the capital cash flow (CCF) methods. However, there is still ongoing debate with regard to their equivalency and the convenience of their applications. For example, Booth (2002, 2007) claims that one can always find a WACC by using it to discount the relevant cash flows to get the known present value of the firm. In other words, WACC is a flat rate that gives the same present value after discounting the free cash flows (FCF) as the present value given by the APV method. On the other hand, Sabal (2007) asserts that the WACC method is appropriate only for firms whose tax rate and debt ratio remain constant, while the APV method is not subject to this restriction. This leads to the understanding that the APV is more convenient than the WACC method for valuation of emerging market projects and firms where tax legislation may vary period by period or could affect profits not only through the standard corporate tax rate and a target leverage ratio is not pursued (see, e.g., Pereiro, 2002; Sabal, 2005). In particular, Sabal (2007) (hereafter Sabal) claims that many larger firms in industrialized economies set up a target debt ratio for the long term and WACC is an acceptable approximation, while high economic uncertainty in emerging economies makes the leveraging decision much more opportunistic with non-traditional tax structures and exchange rate policies. To illustrate how different valuation approaches work, Sabal uses a specific numerical example to show that the WACC, APV, FTE, CCF methods give the identical valuation results for firms with no-growing financial debt. He also extends the example to demonstrate that the APV method is easily applicable with regard to the appropriate discount rates by showing that his numerical example completely agrees with a theoretical framework for tax shields valuation laid out by Fernández (2004, 2005, 2006) who claims that the value of the tax shields is not the present value of the tax shields. Sabal believes that Fernández’s framework resolves the dispute regarding the tax shield’s discount rate, and basically uses it as a final check for the validity of his example and the related claims made in his own paper.

However, due to a few flaws and inconsistencies in that study, some of Sabal’s assertions are misleading. For example, the debate on tax shield’s discount rate is not resolved by Fernández. Cooper and Nyborg (2006, 2007) directly refute Fernández’s claims by showing how Fernández misinterprets the underlying capital structure assumptions; Liu (2009) provides a different interpretation of business valuation in terms of earned and unearned tax shields. It is natural to raise the question: what does Sabal’s example really tell about the APV, FTE, CCF and WACC methods as well as Fernández’s claims.
Specifically, does it really support the equivalency among those valuation methods for firms with no-growing financial debt? Does it really show the validity of Fernández’s claims? And what are the consequences for valuing firms in emerging economies. In this study, we intend to answer these questions by identifying a few intrinsic inconsistencies in Sabal (2007) and making an effort to clarify the underlying theories.

II. CAPITAL STRUCTURE CHOICES AND TAXES IN DIFFERENT ECONOMIES

The argument regarding a target debt ratio is called in question in several respects. First, the assertion that many larger firms in industrialized economies set up a target debt ratio for the long term appears to be based on faith instead of evidence. On the one hand, it is harder for large firms to frequently change their capital structure to meet the target if there indeed exists one. Fischer, Heinkel and Zechner (1989) find that firms operate within a wide range of leverage ratio because they do not continuously rebalance their capital structure. Graham and Harvey (2001) show that a large number of managers indicate that they do not rebalance their capital structure in response to equity market movements because the presence of adjustment costs prevents firms from rebalancing continuously. Pinegar and Wilbricht (1989), and Hittle, Haddad and Gitman (1992) show that only a small percentage of the large US firms set a target leverage ratio. If the deviation of a firm’s actual debt ratio from its intended debt ratio exhibits a fluctuation large enough over time, then the firm’s debt ratio cannot be approximated as a constant even if the firm does intend to maintain a target. On the other hand, there seems to be a considerable amount of evidence not only against a target debt ratio but also in support of other types of debt policies. For example, pecking order theory has been long used to explain why firms may not have a well defined target ratio (see e.g., Myers 1993, Liesz 2003, Byoun and Rhim, 2003, and Titman and Wessels 1988). Frank and Goyal (2003) find that the pecking order theory works much better in the 1970s and 1980s.

Second, Sabal believes that non-traditional tax structure in emerging markets makes the leveraging decision much more opportunistic, hence most firms do not implement a target debt ratio. This deserves close examination. For example, China’s tax rules do not allow interest expense paid by an enterprise to be deducted if the debt ratio exceeds a prescribed threshold.\(^1\) One may imagine

\(^1\) Chapter 6 of the Enterprise Income Tax Law (EIT Law), entitled “Special Tax Adjustments,” contains China’s thin capitalization rules. According to article 46 of the EIT Law, interest expense paid by an enterprise to a related party may not be deducted for tax purposes if the debt-to-equity ratio of the enterprise exceeds a prescribed threshold. For financial institutions, this threshold is about 80%; for non-financial institutions, it is about 66%.
accordingly that firms in China would have a more clear and greater incentive than firms in countries (such as the USA) without such rules to shoot for a debt ratio target or at least not to exceed this target. Nonetheless, we note that Sabal correctly points out that the “non-traditional tax structure” such as taxes on inflationary earnings or asset value may add more complication to the WACC method. However, we are not aware of any studies directly assessing the extent of this additional complication. It would be interesting to see more evidence on this important issue since it is crucial to the validity of the WACC method. Now, we start with the usual definition of WACC

$$WACC = \frac{E}{D+E} r_E + \frac{D}{D+E} r_D (1-T_C)$$

(1)

where $E$ is the equity, $D$ is the debt, $r_E$ is the required rate of return on equity, $r_D$ is the cost of debt, and $T_C$ is the corporate tax rate. This definition assumes no loss of debt interest tax shields. For countries with asset tax regulations similar to those of Mexico’s, asset tax on inflationary earnings would result in an adjustment in the effective tax rate $T_C$ in calculating WACC and a reduction in the firm’s free cash flow (FCF). In order to correctly apply the WACC method, both FCF and the adjustment in $T_C$ must be correctly determined for every period. Therefore, there could be a different $WACC_t$ for each time period $[t, t+1]$, which may make the APV method more convenient if one can forecast the tax shield for each time period and determine their correct discount rate. Nevertheless, one hidden assumption made by Sabal is that the WACC method is valid only when both debt ratio and tax rate are constant or close to constant. However, using his example, we show in the next section that this understanding is not completely accurate.

2 However, we are not aware of any research offering direct empirical evidence in support of this conjecture.

3 There are also other potential complicating factors against the WACC method. For example, very small companies tend to experience a graduated tax structure, thus the tax rate can be somewhat dependent on asset value. The author is grateful for clarifications on this issue made by two anonymous reviewers.

4 These asset tax regulations were passed by the Mexican Congress, effective January 1, 2007. Mexico’s asset tax (called IMPAC) is calculated by multiplying 1.25% to the total net assets of the operation with no possibility of reducing the tax base for the company’s liabilities, thus the debt interest loses the tax shield function.

5 For example, Qi, Liu and Johnson (2009) study how to determine the effective tax rate $T_C$ for risky cash flows when there is full or partial loss of tax shields.

6 Because these values are needed in order to apply the APV method. As we will show later on, Sabal implicitly assumes the appropriate discount rate for tax shields is the cost of debt $r_D$ regardless of the underlying debt (ratio) policy, which can be incorrect.
III. WACC, APV AND CAPITAL STRUCTURE

Many believe that the WACC method is valid only when the firm’s leverage ratio is maintained to be constant by continuous rebalancing. Sabal’s main conclusion is based on this understanding. However, it may not be correct to regard constant leverage ratio as a necessary condition for the WACC method to be valid.

To demonstrate how to apply the WACC method, Sabal first claims that Eq. (1) (also (1) in Sabal, 2007) is derived by Miller and Modigliani (1958, 1963). This is not true. Equation (1) is nothing but a straightforward definition of the WACC by recognizing the tax shield which reduces the net cost of debt \( r_D \) after accounting for the tax deduction of \( T_C \times r_D \). It is not derived but self-evidently defined. He then claims that Eq. (2) (also Sabal’s (2)) is given by Haley and Schall (1973) as follows

\[
WACC = \left(1 - \frac{DT_C}{V}\right) \times r_A
\]  

(2)

where \( V \) is the total firm value, and \( r_A \) is the asset return or the opportunity cost of capital.\(^7\) However, this is incorrect as well. Eq. (2) is derived by Miller and Modigliani (1963) and is one of MM’s major results, commonly called “the MM formula” in the literature.

Combining Eqs. (1) and (2), Sabal finds the required equity return \( r_E \) to be

\[
r_E = r_A + \frac{D}{E} \left[ (r_A - r_D) \times (1 - T_C) \right]
\]  

(3)

and the value of the levered firm \( V_L \) to be

\[
V_L = V_U + DT_C
\]  

(4)

where \( V_U \) is the value of the unlevered firm. Normally, the term \( DT_C \) is called the present value of the tax shields derived by Miller and Modigliani (1963). Eqs (1) – (4) are the same as equations (1) – (4) in Sabal (2007). As a matter of fact, Eq. (4) is just a special case of the adjusted present value (APV) approach which is based on the principle of value additivity. The general approach of the APV is proposed by Myers (1974).\(^8\)

\(^7\) \( r_A \) is used to discount the (after-tax) \( FCFs \) to give the firm value of the unlevered firm.

\(^8\) The adjusted present value (APV) method says that the levered firm’s value is equal to the unlevered firm value plus the present value of the tax shields. It is the application of the value additivity principle.
It might be necessary to clarify the relationships among these equations and formulas. Eq. (4) is MM Proposition I and (3) is MM Proposition II. They are not derived from Eqs. (1) and (2). Rather, it is the other way around – Eq. (2) is derived from (4); Eq. (3) is derived from (2) – the MM formula – and the definition of the WACC in (1). These derivations are fairly straightforward. For more details, we refer the audience to Brealey, Myers and Allen (2005) and Cooper and Nyborg (2006, 2007).

The present value of the tax shield in Eq. (4) is obtained by discounting the perpetual tax shields \( r_D DT_C \) with the cost of debt \( r_D \). As argued in Cooper and Nyborg (2006, 2007), this is valid only for fixed debt, not for constant leverage ratio. Indeed, in the original derivation in MM (1963), debt is treated as a fixed dollar amount and it is assumed that individuals can replicate the equity cash flows by lending or borrowing at the same rate \( r_D \) as the firm’s cost of debt. Without the assumption of the same borrowing rate, Eq. (4) would be no longer valid. For constant leverage ratio, Cooper and Nyborg (2006, 2007) show that the proper discount rate for the tax shields is asset return \( r_A \), which leads to a different firm value than given in Eq. (4), and subsequently Eqs. (2) and (3) will be different. The reason \( r_A \) replaces \( r_D \) if the debt ratio is constant is that the tax shields would fluctuate in proportion to the total asset value hence they require the same discount rate \( r_A \).\(^9\)

Therefore, to claim the WACC method is only valid when leverage ratio is constant is not accurate, just as shown above that the WACC approach also works at least for the fixed debt scenario where WACC is given by the MM formula, Eq. (2). Actually, Sabal’s example for different valuation methods is based on the condition of fixed debt, and this is why his using Eqs. (2) and (3) for the WACC demonstration gives self-consistent results because Eqs. (2)-(4) are based on the fixed debt assumptions as well (e.g., see Miller and Modigliani 1963; Brealey, Myers and Allen 2005).\(^10\) Therefore, it is not surprising he gets the identical results by both the WACC and the APV method. Indeed, Booth (2002; 2007) goes even further and shows that WACC can be thought of a rate that would make

\(^9\) The relationships among the required equity return \( r_E \), capital structure assumptions, cost of debt \( r_D \), and asset return \( r_A \), corporate tax rate \( T_C \) are summarized in Johnson and Qi (2008).

\(^10\) For constant leverage ratio situation (e.g., see Cooper and Nyborg 2006, 2007), WACC formula would be different than (2) and the APV formula would be different than (4) as well. Thus, using the WACC and the correct APV formulae, we can also obtain the correct and consistent results. However, we note that in practice WACC is obtained from the market values, but doing so implicitly assumes the market values are correct. As one anonymous reviewer correctly points out, this is perhaps one point in favor of APV.
discounted FCFs have the same present value as that by the APV method. Booth vividly termed this “you can always get there (APV) from here (WACC)”\(^\text{11}\).

In sum, Sabal uses the fixed debt situation as given in (1) and (2) to illustrate the WACC method while claiming the WACC method is only valid for the constant leverage ratio situation where debt is fluctuating in proportion to the firm’s assets. In other words, what he actually shows is that the WACC method can be applied to the fixed debt situation, which does not lend any support to his claims about the constant leverage ratio situation\(^\text{12}\).

IV. CCF METHOD

The Capital Cash Flow (CCF) method proposed by Ruback (2002) uses asset return \(r_A\) to discount the capital cash flow defined as the overall after-tax cash flow received by both debtholders and equityholders which is equal to the cash flow from the unlevered firm plus the tax shield. Therefore, it is essentially using asset return \(r_A\) to discount the tax shields \(r_D DT C\) rather than using cost of debt \(r_D\). There is still debate on whether the CCF method can be used in situations other than the constant leverage ratio case.\(^\text{13}\) We do not participate in the debate here. Instead, we raise the paradox – if the CCF framework is correct and self-consistent,\(^\text{14}\) then the firm value given by it should be different (due to the different discount rate for the tax shields), but how can all the four valuation approaches – the WACC, the APV, the FTE, and the CCF methods – arrive at the same result? In other words, if \(r_A\) is the discount rate for the tax shields in the CCF method, and \(r_D\) is the discount rate for the tax shields in the WACC and the APV methods, then they should give different present value of the tax shields, which should lead to different firm values. However, Sabal demonstrates in his numerical example that they all give the identical firm value (i.e., $108.34 million).

Now we reveal the hidden inconsistency in the way the CCF method is implemented in Sabal’s example and show that a correct implementation of it may generate a different result. We replicate the example in Sabal (2007) in Table 1.

\(^{11}\) Booth (2002) appears in the reference list in Sabal (2007) but Booth’s argument does not seem to be quoted anywhere in the body of the paper.

\(^{12}\) For firms maintaining a constant debt ratio, the WACC and the APV methods are indeed consistent, but the implementation of the APV is not as demonstrated by Sabal who implicitly takes the cost of debt \(r_D\) as the only proper discount rate for the tax shields regardless of the debt policy. In Section V, we will reveal and analyze another hidden inconsistency originating from this misunderstanding about the tax shields.

\(^{13}\) For example, see Booth (2002, 2007); Cooper and Nyborg (2006, 2007); Fernández (2004, 2005, 2006).

\(^{14}\) By self-consistent, we mean that the assumptions embedded in the framework do not exhibit any contradictions.
Table 1. The firm’s balance sheet - A replicate of the example’s table in Sabal (2007).

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tangible Assets: $83.34 million</td>
<td>Debt: $50 million</td>
</tr>
<tr>
<td>Tax Shield: $50 million × 0.5 = $25 million</td>
<td>Equity: $58.34 million</td>
</tr>
<tr>
<td>Total Value: $108.34 million</td>
<td>Total Value: $108.34 million</td>
</tr>
</tbody>
</table>

Corporate tax rate $T_C$ is assumed to be 50%, asset return $r_A$ is taken as 12%, and cost of debt $r_D$ is assumed to be 4%. First, Sabal uses Eq. (3) to calculate the required rate of return on equity $r_E$ and it is 15.43% (see Sabal’s Equation (7)).

Then Sabal calculates “CCF discount rate” $r_{CCF}$ as follows (i.e., Sabal’s (13)),

$$r_{CCF} = \left( \frac{D}{V} \right) r_D + \left( \frac{E}{V} \right) r_E = \left( \frac{50m}{108.34m} \right) \times 4% + \left( \frac{58.34m}{108.34m} \right) \times 15.34\% = 10.15\%$$  (5)

where “m” denotes million. The capital cash flow (CCF) is calculated as follows,

$$CCF = D \times r_D + E \times r_E = 50m \times 4\% + 58.34 \times 15.43\% = \$11m$$  (6)

Thus, the firm value by the CCF method is

$$PV = \frac{\$11m}{0.2025} = \$108.34m$$  (7)

This result is used to show that the firm value ($108.34 million) given by the CCF method is identical to that given by the WACC and the APV methods.

However, a close investigation of this procedure, i.e., (5)-(6)-(7), raises a question. First, using (5) and (6) (i.e., Sabal’s Eqs. (13) and (14)) will always give the same firm value $V$ as given by (7) regardless of variables’ values. In other words, it is not surprising that Eq. (7) gives consistent firm value ($108.34 million in this case). To see this, we assume perpetuity for simplicity and thereby use (5) to divide (6) in the algebraic form as follows,

$$\frac{CCF}{r_{CCF}} = \frac{D \times r_D + E \times r_E}{\left( \frac{D}{V} \right) r_D + \left( \frac{E}{V} \right) r_E} = \frac{\left( D \times r_D + E \times r_E \right)}{D \times r_D + E \times r_E} \equiv V$$  (8)
Therefore, the CCF method applied in this way will necessarily appear to be valid for *any situation* because it is simply a rearrangement of variables in a generic sense to ensure we get \( V \) if we start with \( V \). To highlight the point we wish to make, consider the following question: if we did not know \( V = $108.34 \) million, could we still find the same firm value through the CCF method implemented in this circular fashion? The answer is obviously no, because this is not the correct application of the CCF method meant to be. Now we analyze what went wrong here.

First, the CCF method applied in this fashion adds nothing new. If the firm value \( V \) is already known in Eq. (5) when calculating \( r_{CCF} \), then why bother going through (6) and (7) to arrive at nothing but the identical firm value?\(^{15}\)

Second, in practice, normally the capital cash flows (CCFs) are inferred from the firm’s (historical/forecasted) income statement and balance sheet. Using (6) (i.e., Eq. (14) in Sabal 2007) to determine CCFs is awkward. On the one hand, CCFs determined by (6) are expected cash flows which can be different from the actual CCFs from (past and forecasted) income statement and balance sheet. On the other hand, using a known debt value \( D \) and equity value \( E \) in (6) to calculate CCFs, one already has more information than just the total firm value \((E + D)\). The proper use of the CCF method is to determine the firm value from the forecasted capital cash flows (CCFs), not using the assumed firm value to calculate the CCFs simply to confirm the assumed firm value in a circular process. What is the point if one has to know the firm value first before the method can be used to determine the firm value. This is a very important point regarding how to use the CCF method. Normally, to find the capital cash flows (CCFs), one first determines the free cash flow (FCF) and the tax shield for each time period, then the capital cash flow CCF is simply the summation of the FCF and the tax shield.

Third and more importantly in the theoretical sense, the discount rate for the tax shields in the CCF method is unequivocally asset return \( r_A \) (e.g., see Ruback, 2002; Booth, 2007), not any other discount rate such as \( r_{CCF} \) given by (5), i.e., Sabal’s (13). The correct way to back out unobserved asset return \( r_A \) is combining (1) and (4) and letting corporate tax rate \( T_C \) equal 0, which implies that the levered firm value equals the unlevered firm value. This because by forcing \( T_C = 0 \), we simply assume away the tax shield. Without the tax shields, there would be no difference between a levered and an unlevered firm in terms of

\(^{15}\) Ruback (2002) suggests the useful application of his CCF method is for the high leverage buyouts where capital structure changes drastically. We note, however, this claim is under ongoing debate (e.g., see Booth, 2007).
value, i.e., \( V_L = \frac{FCF}{WACC} = V_U = \frac{FCF}{r_A} \), and the associated WACC without the tax benefit is given by a modified Eq. (1), i.e., \( WACC = \frac{E}{D+E} r_E + \frac{D}{D+E} r_D = r_A \).

This is exactly what the MM capital structure irrelevance theorem says when corporate tax is assumed away, because with bankruptcy ruled out the only consequence from debt is the tax shields and they disappear if tax rate is zero. Rearranging the above WACC-\( r_A \) expression to have

\[
r_A = \left( \frac{D}{V} \right) r_D + \left( \frac{E}{V} \right) r_E \tag{9}
\]

This shows that given the standard assumptions made in Miller and Modigliani (1958, 1963) including corporate taxes, (9) will necessarily give asset return \( r_A \), and not anything else such as \( r_{CCF} \) unless \( r_{CCF} = r_A \). However, (5) (i.e., Sabal’s Eq. (13)) gives \( r_{CCF} = 10.15\% \neq r_A = 12\% \), which highlights the mistake in the CCF method application in Sabal’s example. Next, we analyze what causes this mistake and whether the CCF method would give the same firm value (e.g., $108.34 million in Sabal’s example).

The reason \( r_{CCF} = 10.15\% \neq r_A = 12\% \) is obtained through (5) is that Sabal uses \( r_E = 15.43\% \) given in Eq. (3), i.e., Sabal’s Eq. (8), as follows

\[
r_E = r_A + \frac{D}{E} \left[ (r_A - r_D) \times (1 - T_C) \right] = 12\% + \frac{50}{58.34} \left[ (12\% - 4\%) (1 - 0.5) \right] = 15.43\%
\]

But this formula for \( r_E \) is based on (4), i.e., \( PV (\text{tax shields}) = DT_{T_C} \), because (3) is derived from combining (1) and (2), while (2) is derived from (4). With the CCF method, the present value of future tax shields is different (e.g., see Ruback 2002; Cooper and Nyborg 2006, 2007). We note that Sabal claims that the present value of the tax shields is a solved issue by Fernández (2004). However, this claim is not accurate and not up to date. In fact, the debate is on-going. For example, Cooper and Nyborg (2006, 2007) give quite different views on the present value of the tax shields in contrast with Fernández’s view as briefly mentioned in Sabal (2007). Liu (2009) provides a different view of the tax shield value by splitting it into earned and unearned portions. While we do not comment

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16 Of course, bankruptcy costs are not considered in this line of research.
on these different views regarding the tax shields, we believe it is important and pertinent to point them out in this venue.

Therefore, an $r_e$ consistent with the correct application of the CCF method would be necessarily different from $r_e = 15.43\%$ given in Sabal’s example. This is because of the different values of the tax shields would be assumed in Eq. (4), i.e., according to MM (1963), it is $DT_C$, which is adopted in Sabal’s example; and $r_D DT_C / r_d$ based on the CCF method. Taken together, one should expect the CCF method to give a different firm value than $108.34$ million.\(^\text{17}\) Indeed, the CCF and the WACC methods do not always agree with each other.\(^\text{18}\) The WACC method, however, would always agree with the APV method if applied correctly, and the CCF method tends to predict lower firm values because it tends to predict a lower present value of the tax shields.\(^\text{19}\)

However, it is interesting to note that in the last part of Sabal (2007), the example is extended to show that the value of the tax shields is consistent with his applications of the various valuation methods (see Sabal’s (18) – (20)). If this were completely correct, the inconsistencies we reveal in this paper would not exist and our critique would become invalid. Next we analyze this issue about the treatment of the tax shields.

V. VALUING THE TAX SHIELDS

A major conclusion drawn by Sabal as demonstrated by his numerical example is that the APV method is better for NSFs (nonstandard firms) which includes firms in emerging markets. In particular, according to Sabal,

“This brings us to conclude that APV looks better suited for NSFs than the WACC-derived methods. However, at first glance the practical application of APV is hampered by the fact that the discount rate for the tax shield is not clearly defined. Fortunately, a recent paper (“Fernández, 2004,” added) offers a solution to the debt tax shield problem. … … Therefore, the problem stemming from the correct discount rate applicable to the tax savings seems to be resolved ……”

First of all, we wish to point out that the value of the tax shields is not quite resolved as claimed above.\(^\text{20}\) This is a vital point we need to make because Sabal

\(^{17}\) For detailed application of the CCF method, see Ruback (2002).

\(^{18}\) We note that Sabal correctly points out that these two methods do not agree in most real-world situations.

\(^{19}\) See, for example, Booth (2007) for the comparisons among the various valuation methods.

\(^{20}\) For example, studies by Cooper and Nyborg (2006, 2007) and Liu (2009) present different views than Fernández’s assertion that “the value of tax shields is not the present value of the tax
uses Fernández’s framework to validate his example and thereby draw the main conclusion.

According to Fernández (2004), the value of the tax shields is the difference between the present value of the taxes that the firm would have paid if it were all-equity financed, and that of the taxes actually paid by the levered firm. Based on this framework, Sabal further explains that the first cash flows are directly related to the firm’s unlevered profits hence the appropriate discount rate is the unlevered equity return which is asset return $r_A$; the second cash flow stream (i.e., the taxes paid by the levered firm) is tied to period-by-period levered profits and therefore their discount rate is the period-by-period equity discount rate $r_E$.

Then, using the numbers in the numerical example, Sabal demonstrates through his equations (18) – (20) that an application of Fernández’s framework indeed yields $25$ million as the value of the tax shields, a result identical to the value calculated earlier (by using $DT_C$). This appears to be a powerful piece of evidence supporting the claim that the APV method is better because Fernández’s framework makes it applicable and the result perfectly agrees with the known (or preset) value. We do not necessarily disagree that the APV method may be more suitable for certain scenarios as given by Sabal and others. However, we would like to make two points. First, the application of Fernández’s framework does not add anything new because it is already implicitly implied within Sabal’s example. Second, Fernández’s framework actually reconfirms the inconsistencies explained earlier about his example. Next, we offer the proof.

For brevity, we do not repeat Sabal’s actual computations (specifically, his equations (18) – (20)); instead, we furnish an algebraic proof. For an unlevered firm, the corporate tax for period $[t, t + 1]$ is $EBIT \times T_C$, where it is assumed, as by Sabal, that the expected EBIT remains a constant. If the firm is levered, then the tax becomes $(EBIT - r_D D) \times T_C$, which is less due to the tax shield of $r_D DT_C$ over period $[t, t + 1]$. The proper discount rate for the tax shields is asset return $r_A$ for firms with a constant debt ratio, and $r_D$ for fixed-debt scenario (see for example, Cooper and Nyborg, 2006, 2007; and Brealey et al, 2005).

However, let’s assume for the moment that we only know the tax shield discount rate is $r_X$. According to Fernández’s framework as explained in the early part of this section and implemented by Sabal, we have

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shields”, while Cooper and Nyborg (2006, 2007) show that this assertion is incorrect because of misinterpretations of the underlying capital structure assumptions.
\[
\frac{EBIT \times T_C}{r_A} - \frac{(EBIT - r_D D) \times T_C}{r_E} = \frac{r_D D T_C}{r_X} = PV [\text{tax shields}]
\]

(10)

Multiplying (10) by \(\frac{1}{CCTT} - (1 - T_C)\) on both sides, it becomes

\[
\frac{EBIT \times (1 - T_C)}{r_A} - \frac{(EBIT - r_D D) \times (1 - T_C)}{r_E} = \frac{r_D D (1 - T_C)}{r_X}
\]

(11)

Recognizing the first term \(EBIT \times (1 - T_C) = FCF\) is the free cash flow,\(^{21}\) and by definition, the unlevered firm’s value \(V_U\) is

\[
V_U \equiv \frac{FCF}{r_A} = \frac{EBIT \times (1 - T_C)}{r_A}
\]

(12)

Also, the second term in (11) is the after-tax flow to equity \((EBIT - r_D D) \times (1 - T_C)\) discounted by equity return \(r_E\), which gives the present value of the equity, i.e., \(E\). Therefore, substituting the left-hand-side terms in (11) by \(E\) and \(V_U\) to arrive at

\[
V_U - E = \frac{r_D D (1 - T_C)}{r_X}
\]

(13)

Rearrange (13) to have

\[
(E + D) - V_U = D - \frac{r_D D (1 - T_C)}{r_X} = D \left(1 - \frac{r_D (1 - T_C)}{r_X}\right)
\]

(14)

Where \((E + D) - V_U\) on the left-hand-side is the difference between the value of the levered firm and that of the unlevered firm, which is exactly the value of the tax shield. Since Sabal, as in MM (1958, 1963), takes the value of the tax shields to be \(DT_C\), we can equate the right-hand-side of (14) to \(DT_C\).

\(^{21}\) FCF is defined as \([EBIT \times (1 - T_C) - Inv]\) where \(Inv\) is the necessary operational investment. Without losing generality, it is normally convenient to let \(Inv = 0\), see for example, Brealey et al (2005), and Brigham and Ehrhardt (2004).
\[ DT_C = D \left( 1 - \frac{r_D (1 - T_C)}{r_X} \right) \] (15)

Solving (15), one can quickly obtain \( r_X = r_D \), which implies that in the context of Sabal’s example, Fernández’s framework is nothing but using \( r_D \) as the discount rate for the tax shields even though it appears to completely avoid the touchy issue of tax shields’ discount rate as a novel approach. However, \( PV[\text{tax shields}] = DT_C \) and \( r_X = r_D \) are already explicitly assumed throughout his example, Fernández’s framework thus does not add any new information. Alternatively, one may also start with these two equalities and work backwards from (15) to (10) to derive “Fernández’s framework” implied by Sabal’s example. Thus, we confirm the first point we wish to make.

Furthermore, since \( PV[\text{tax shields}] = DT_C \) and \( r_X = r_D \) are assumed throughout and “reconfirmed” by applying Fernández’s framework (as shown above), Sabal’s example is for the fixed debt situation.\(^{22}\) The inconsistency, as we discovered earlier, still remains in that the example demonstrates the feasibility of the WACC method when the debt is fixed while Sabal asserts that it is valid only for the constant debt ratio scenario. By the same token, using Fernández’s framework to calculate the value of the tax shields does not resolve the problem with the CCF method implemented with Sabal’s example, because CCF requires \( r_X = r_A \) regardless of the underlying debt ratio. The reason applying the CCF method in Sabal’s example also produces the same firm value is because it is not implemented correctly (see the discussion below Eq. (9)). After correcting this mistake, the CCF method would generate a different result. Using Fernández’s framework simply reconfirms the existence of this embedded inconsistency instead of resolving it.

VI. CONCLUSIONS

Business valuation is an important issue and can have great consequences in our decision making. Thus, a clear understanding and correct application of the various popular valuation methods is necessary. However, there are still subtle confusions in this area. An interesting study by Sabal (2007) provides a very succinct and fairly comprehensive example linking all the major valuation methods and a few claims are made based on it. Using his well-designed example, we identify a few hidden flaws and inconsistencies in that study. We

\(^{22}\) See, for example, Cooper and Nyborg (2006, 2007), Brealey et al (2005), etc. for the argument for obtaining the result of \( PV[\text{tax shields}] = DT_C \).
first raise questions about a common understanding that most large companies in industrialized economies have target leverage ratios. Then we show in detail that the application of the CCF method in Sabal (2007) is inconsistent with the underlying theories and their assumptions. We also demonstrate that it is incorrect to claim that the WACC method is suitable only for the constant debt ratio scenario, which is a common misleading notion in academia. Lastly, we explain why the approach to valuing tax shields by Fernández (2004) does not really prove the claim that the APV method is more convenient for firms in emerging markets. We simply want to caution that this claim cannot be drawn based on the evidence and analysis presented even if it itself might be true.

Since these subtle and hard-to-notice errors in the application and understanding of the valuation methodologies are quite common in academia and industry, we hope to, by illustrating them with the help of a tightly-designed numerical example, shed more light on their proper use, and clarify a few misunderstandings about the relevant theories. Our investigation is an integral part of this line of research which benefits directly from the work by Sabal (2005, 2007) who designs a succinct example that helps to reveal and highlight the issues discussed in this study, and we acknowledge the merit of Sabal’s work and some of its insights.

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