THE RELATIONSHIP BETWEEN FRANKING CREDITS AND THE MARKET RISK PREMIUM: A COMMENT

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Abstract

This paper examines two arguments presented in Gray and Hall (2006): firstly, that the generally employed estimate of .06 for the market risk premium within the Officer version of the CAPM and the generally employed estimate of .50 for the parameter "gamma" within the Officer framework are jointly inconsistent with evidence concerning the market risk premium in the standard version of the CAPM; secondly that the first two of these parameter estimates are also jointly inconsistent with the observed cash dividend yield on the Australian market. To resolve these problems, Gray and Hall recommend setting gamma to zero. This paper shows that the first argument does not account for the fact that imputation induces a reduction in the market risk premium as defined in the standard version of the CAPM. This paper also shows that both arguments identify a problem that characterises only parts of the Officer framework, and these parts are not generally employed in Australia. So, rather than suggesting that gamma should be zero, Gray and Hall's analysis identifies parts of the Officer framework that should be avoided.

1. Introduction

In setting output prices for regulated firms, the Officer (1994) version of the Capital Asset Pricing Model is generally employed by Australian regulatory bodies. Furthermore, the generally employed estimate for the market risk premium within this model is .06 and the generally employed estimate for the parameter denoted "gamma" within the Officer framework is .50. Gray and Hall (2006) argue that these two parameter estimates are jointly inconsistent with estimates of the market risk premium in the standard version of the CAPM (Sharpe, 1964; Lintner, 1965; Mossin, 1966). They also argue that these two parameter estimates are jointly inconsistent with the observed cash dividend yield on the Australian market. Finally, they argue that both inconsistencies should be resolved by attributing zero value to imputation credits. This paper seeks to evaluate Gray and Hall's arguments.

2. The Market Risk Premium and Imputation Credits

Within the Officer (1994) framework, Gray and Hall (2006, section 3) argue that the market risk premium inclusive of the value of imputation credits (MRP_{fc}) is related to the market risk premium defined in the usual way to exclude imputation credits (MRP_{dc}) as follows

$$MRP_{dc} = \left[MRP_{fc} + R_f\right]\left[\frac{1-T}{1-T(1-\gamma)}\right] - R_f \tag{1}$$

where R_f is the risk free rate, T is the statutory company tax rate and γ is the product of the utilisation rate on imputation credits (U) and the proportion of company tax paid that is distributed as imputation credits (IC/TAX). Given a company tax rate of T = .30 and using R_f = .06 along with conventional estimates for MRP_{fc} and γ of .06 and .50 respectively, the resulting estimate of MRP_{dc} is as follows.

$$MRP_{dc} = \left[.06 + .06\right]\left[\frac{1-.30}{1-.30(1-.50)}\right] - .06 = .039$$

Gray and Hall (ibid) note that such an estimate is markedly less than Dimson et al's (2003, Table 1) estimate for Australia of .076 (using 1900-2002 data).[1] They go on to argue that the inconsistency should be resolved by setting $\gamma = 0$, i.e., by setting $U = 0$.

This line of argument has three difficulties. Firstly, the estimate of .039 is an estimate of MRP_{dc} under an imputation environment whilst the Dimson et al estimate of .076 is based upon data that largely predates the introduction of imputation. Thus, the act of comparing .039 with .076 implicitly assumes that the introduction of imputation does *not* change MRP_{dc}. This assumption is implausible and recognition of this point largely addresses the problem. To see this, consider the following simplified scenario. Suppose that imputation does not change the level of *cash* dividends on the market portfolio and these cash dividends are expected to increase at rate g from their current level of DIV_m per year. Regardless of whether imputation operates or not, the value of the market portfolio (V) can be expressed as the present value of the cash dividends using the discount rate k_m (being the discount rate applicable to cash dividends and capital gains). With constant growth in expected cash dividends, the Gordon formula applies as follows.

$$V = \frac{DIV_m(1+g)}{k_m - g}$$

The introduction of imputation raises V but has no impact on DIV_m or g. So, k_m must fall (in recognition of a reduction in the personal taxes associated with the cash dividends). Accordingly, MRP_{dc} *must* fall. One can also express the value of the market portfolio (both before and after the introduction of imputation) as the present value of $D\hat{I}V_m$ (dividends inclusive of imputation credits, to the extent of being usable) using the discount rate $\hat{k}_m$ that incorporates the effect of imputation credits. For the constant growth case, with expected growth rate g, the result is as follows.

[1] Gray and Hall (2006, section 4.1) also consider the possibility that the estimate of .06 is an estimate for MRP_{dc} rather than MRP_{fc}, and therefore derive an estimate for MRP_{fc} of .086. However, in respect of Australian regulators, they clearly use the Officer (1994) version of the CAPM and they generally estimate the market risk premium within this model at .06. Thus, the estimate of .06 must represent an estimate for MRP_{fc}.

$$V = \frac{D\hat{I}V_m(1+g)}{\hat{k}_m - g}$$

Imputation raises $D\hat{I}V_m$, and this embodies the full effects of imputation. So, V should rise by the same proportion. It follows that $\hat{k}_m$ would be unchanged. Accordingly, MRP_{fc} would be unchanged by the introduction of imputation. Since MRP_{dc} falls, and $MRP_{dc} = MRP_{fc}$ prior to imputation, then the reduction in MRP_{dc} will equal the (post-imputation) difference between MRP_{dc} and MRP_{fc}, i.e., .021. Thus, a post-imputation estimate for MRP_{dc} of .039 implies a pre-imputation estimate of .06 and therefore an average value for MRP_{dc} across the period 1900-2002 of .057. This estimate of .057 is not statistically significantly different from Dimson et al's estimate of .076. Thus, merely by recognising that MRP_{dc} falls upon the introduction of imputation, the problem alleged by Gray and Hall is largely addressed.[2]

The second difficulty relates to the assumptions underlying Officer's framework. The Officer framework to which Gray and Hall allude constitutes the Officer (1994) version of the CAPM, three valuation models and the three WACC models associated with them, with the latter reflected in Officer's equations (7), (10) and (12). In developing these three valuation models and the associated WACC models, Officer implicitly assumes that the firm's expected future cash flows are a level perpetuity and that taxable income is equal to pre-tax cash flow from operations (see Officer, 1994, pp. 6-7). Gray and Hall invoke the same two assumptions in developing equation (1) above. These two assumptions are necessary to the development of equation (1), to Officer's three valuation models, and to his WACC model (7). However, they are not necessary for the WACC models corresponding to Officer's equations (10) and (12).[3] Consequently, the conclusions that Gray and Hall draw from equation (1) concerning the Officer framework are relevant to only parts of the Officer framework, being his three valuation models and his WACC equation (7).

[2] The same argument is relevant to the comparison that Gray and Hall undertake between the estimate of .039 for Australia and the estimates from Dimson et al for various foreign markets, in so far as these foreign markets also adopted imputation at some point after 1900.

[3] Appendix 1 shows that the "vanilla" WACC model corresponding to Officer's equation (12) can be derived without recourse to the two assumptions. A similar proof would support the WACC equation corresponding to Officer's equation (10).

However, Australian regulators do not invoke any of his valuation models; in general, they invoke the Officer version of the CAPM along with the "vanilla" WACC model corresponding to Officer's equation (12) (see ACCC, 2004, p 16; ESC, 2005, pp. 332-333; QCA, 2005, pp. 98-99). So, the conclusions that Gray and Hall draw from equation (1) concerning the Officer framework are irrelevant to this regulatory work.

Thirdly, even if some Australian regulators did use parts of the Officer framework that rested upon these two assumptions, and equation (1) was then relevant, and equation (1) were considered to generate implausibly low values of MRP_{dc}, setting $\gamma = 0$ is neither the only way to resolve the problem nor even the most sensible choice. A better alternative would simply be to avoid these parts of the Officer framework (consistent with standard practice by Australian regulators) because the two underlying assumptions are so unrealistic (especially the level perpetuity assumption).

Since Australian regulators in general avoid those aspects of the Officer framework to which equation (1) is relevant, the relationship between MRP_{dc} and MRP_{fc} is then as follows. Letting D_m denote the cash dividend yield on the market portfolio, and IC_m the imputation credits attached to the cash dividends DIV_m paid on the market portfolio, it follows that[4]

$$\hat{k}_m = k_m + UD_m \frac{IC_m}{DIV_m} \tag{2}$$

Deducting R_f from both sides of equation (2) and rearranging yields

$$MRP_{dc} = MRP_{fc} - UD_m \frac{IC_m}{DIV_m} \tag{3}$$

In respect of D_m and IC_m/DIV_m, recent estimates are .04 and .34 respectively.[5] In respect of the utilisation rate U, Gray and Hall (2006, footnote 3) argue that an

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[4] This equation (2) arises purely from the definitions of k_m and $\hat{k}_m$, and is presented as equation (13) in Lally and van Zijl (2003). It also corresponds to equation (17) in Officer (1994), but with correction of the typographical error noted by Gray and Hall (2006, page 413).

[5] These figures are averages over the (similar) estimates kindly provided by First New Zealand Capital, UBS and Goldman Sachs JB Were. The estimate of .04 for D_m matches that used by Gray and Hall.

estimate for this parameter that is consistent with γ = .50 is approximately U = .60. Substitution of these parameter estimates into equation (3), along with MRP_{fc} = .06, yields

$$MRP_{dc} = .06 - .60(.04)(.34) = .052$$

So, an estimate for MRP_{fc} of .06 under imputation implies an estimate for MRP_{dc} of .052 rather than the .039 claimed by Gray and Hall.[6] With a pre-imputation estimate for MRP_{dc} of .06 as discussed earlier, the average value for MRP_{dc} across the 1900-2002 period used by Dimson et al (2003) would then be .059, and this is even closer to their benchmark figure of .076 than before.

3. The Market Risk Premium, Imputation Credits and Cash Dividends

Gray and Hall (2006, section 4) argue that the Officer framework, along with conventional estimates for MRP_{fc} and γ of .06 and .50 respectively, imply an estimate for D_m that is markedly in excess of the observed value. As noted previously, equation (1) along with T = .30, R_f = .06, MRP_{fc} = .06 and γ = .50 yields an estimate for MRP_{dc} of .039. It follows that

$$\hat{k}_m - k_m = MRP_{fc} - MRP_{dc} = .06 - .039 = .021 \qquad (4)$$

Gray and Hall (section 4.1) also invoke equation (2) above with IC_m/DIV_m set to its maximum value of .428, i.e.,[7]

$$\hat{k}_m - k_m = UD_m \frac{IC_m}{DIV_m} = UD_m(.428)$$

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[6] Gray and Hall (ibid, pp. 413-414) claim that equations (1) and (3) are equivalent, and provide a proof. The examples here rebut that claim. Furthermore, examination of their proof shows that it substitutes a number of results into (2) and then obtains (1). However, one of the results used by them (their equation (22)) presumes that expected cash flows are a level perpetuity and that taxable income is equal to pre-tax cash flow. Absent these assumptions, (1) and (2) are not equivalent; nor then are (1) and (3).

[7] Gray and Hall (2006, page 416) articulate this formula in words rather than mathematical notation. Setting the distribution rate equal to its maximum value of .428 is consistent with the assumptions underlying equation (1) above, i.e., the firm's expected cash flows are a level perpetuity and taxable income is equal to pre-tax cash flow.

Along with U = .60 and the result in equation (4), the implied value for D_m is .082, and this is markedly higher than the observed value of .040. Gray and Hall go on to argue that this inconsistency should be resolved by setting $\gamma = 0$, i.e., by setting $U = 0$.

This analysis invokes both equations (1) and (2) to derive a value for D_m. However, equation (1) alone implies a value for D_m, i.e., the level perpetuity assumption underlying equation (1) implies that D_m must be equal to k_m, which is the sum of R_f and MRP_{dc}. Using Gray and Hall's figures, the latter sum is $k_m = .06 + .039 = .099$ rather than .082.[8] So, the problem is even greater than suggested by Gray and Hall. However, there are two difficulties here. Firstly, even if Gray and Hall had used only equation (1) to derive a value for D_m of .099, and noted the divergence from the observed value, it would not have followed that the entire Officer framework was compromised and therefore warrant setting $\gamma = 0$. As discussed in the previous section, it would only have indicated that parts of the Officer framework were compromised, and these parts are not even used by Australian regulators. The Officer version of the CAPM, and the vanilla WACC model that are generally employed by them, would not be compromised.

Secondly, even if Australian regulators did use these parts of the Officer framework to which Gray and Hall's D_m analysis is relevant, setting $\gamma = 0$ is neither the only way to resolve the problem nor even the most sensible choice. As noted in the previous section, a better alternative would simply be for regulators to avoid these particular parts of the Officer framework in favour of parts that are not affected.

4. Conclusions

This paper has examined two arguments raised by Gray and Hall (2006). The first of these arguments is that the generally employed estimate of .06 for the market risk

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[8] The error here arises because Gray and Hall invoke a value for U of .60, a value for γ of .50, these two values imply that the distribution ratio (credits attached to credits created) must be equal to .833, and this value is inconsistent with the assumptions underlying equation (1), i.e., expected future cash flows are a level perpetuity and taxable income is equal to pre-tax cash flow from operations, which implies a distribution ratio of 1. Had Gray and Hall used a (consistent) estimate for U of .50, they would have obtained a value for D_m of .099.

premium within the Officer version of the CAPM and the generally employed estimate of .50 for the parameter "gamma" within the Officer framework are jointly inconsistent with evidence concerning the market risk premium in the standard version of the CAPM. The second argument is that the generally employed estimate of .06 for the market risk premium within the Officer version of the CAPM and the generally employed estimate of .50 for the parameter "gamma" within this model are jointly inconsistent with the observed cash dividend yield of .040 on the Australian market. In respect of both arguments, they argue that consistency should be restored with a gamma value of zero, and thus a utilisation rate on imputation credits of zero.

The first argument does not account for the fact that imputation induces a reduction in the market risk premium as defined in the standard version of the CAPM, and recognition of this fact would largely deal with the alleged inconsistency. Furthermore, both arguments identify an issue that is relevant to only parts of the Officer framework, and these parts of the framework are not generally employed by Australian regulatory bodies. Even if they were used, a more appropriate means of addressing the problem would be to simply desist from invoking those particular parts of the Officer framework rather than adopting a gamma value of zero. So, rather than suggesting that gamma should be zero, Gray and Hall's analysis identifies parts of the Officer framework that should be avoided.

APPENDIX

This Appendix demonstrates that the vanilla WACC model can be derived without assuming that expected cash flows are a level perpetuity or that taxable income is equal to pre-tax cash flow from operations.[9] Define X_1 to be cash flow from operations for some entity at the end of the next period net of company taxes and new investment, DIV_1 to be the dividend net of any injection of new equity capital, S_t to be the time t value of the equity, B_t to be the time t value of its debt, INT_1 to be the interest payment in one period, k_e to be the cost of equity (defined consistent with the definition of company taxes), k_d to be the cost of debt, k_v to be the vanilla WACC, and $E_t(Y)$ to be the time t expectation of Y. It follows that

$$\begin{aligned} S_0 &= \frac{E_0(DIV_1) + E_0(S_1)}{1+k_e} \\ &= \frac{E_0(X_1) - INT_1 - E_0(B_0 - B_1) + E_0(S_1)}{1+k_e} \\ &= \frac{E_0(X_1) - k_d B_0 - E_0(B_0 - B_1) + E_0(S_1)}{1+k_e} \end{aligned}$$

Rearrangement and recourse to the definition $V_t \equiv S_t + B_t$ yields

$$V_0 + S_0 k_e + B_0 k_d = E_0(X_1) + E_0(V_1)$$

and so

$$V_0\left[1 + \frac{S_0}{V_0}k_e + \frac{B_0}{V_0}k_d\right] = E_0(X_1) + E_0(V_1)$$

and so

$$V_0 = \frac{E_0(X_1) + E_0(V_1)}{1+k_v}$$

This is the vanilla WACC model, i.e., the appropriate discount rate on X_1 is k_v. The derivation does not require that expected cash flows are a level perpetuity or that taxable income is equal to pre-tax cash flow from operations. Extension of this

[9] The analysis broadly follows Miles and Ezzell (1980).

analysis to multiple periods would require the further assumption that k_v does not vary stochastically over time, and hence that leverage, k_e and k_d do not vary stochastically over time; defining k_{vj} as the known value for k_v in period j, the result would be as follows

$$V_0 = \sum_{t=1}^{\infty} \frac{E_0(X_t)}{(1+k_{v1})(1+k_{v2})...(1+k_{vt})} \tag{5}$$

The valuation formulas appearing in Officer require not merely these assumptions but the even stronger assumption that discount rates and leverage do not change even deterministically over time. For example, defining Y_1 as the cash flow to equity holders at the end of the first period and then writing the value of equity as

$$S_0 = \frac{E_0(Y_1)}{k_e} \tag{6}$$

requires inter alia that k_e (and hence leverage) does not vary either stochastically or deterministically over time. Equation (6) arises following the same process as that leading to equation (5), but with the additional assumption that k_e is the same for all future periods as well as the level perpetuity assumption.

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