Estimating the cost of Australian equity capital

It is assumed by some analysts that capital markets operate in a borderless world. If this is true, the cost of Australian equity capital must necessarily reflect this. **MARTIN LALLY** examines the evidence.

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The question of, and consequences flowing from, whether Australian equity prices are determined in the world equities market or merely the Australian market has been widely commented on in recent issues of this journal. For example, Lonergan (2001) asserts that "Australia, an open economy representing only about 1% of the total world sharemarket capitalisation, is a price-taker in the world's capital market."

Bowman (2001) also asserts that Australian capital markets are open and therefore "it is appropriate to assume that Australian debt and equity securities are priced in international markets, and that the Australian MRP is set in an international market."

Both authors draw conclusions from this about the cost of capital for Australian companies. Lonergan concludes that dividend imputation credits would have little impact upon the cost of capital. Bowman concludes that estimates of the Australian market risk premium based on a long time series of Australian returns would be irrelevant to the current cost of capital, because most of the data would be drawn from a period in which Australia was not integrated with world equity markets.

Leaving aside for the moment the question of whether the Australian equity market is fully integrated with world markets, if markets are fully integrated, then the conclusions drawn by Lonergan about the value of imputation credits, and those drawn by Bowman about the relevance of long-term Australian average returns, are correct.

However it must also follow that the appropriate version of the CAPM is one resting upon the assumption of fully integrated markets. Interestingly neither Lonergan nor Bowman explores this conclusion.

In view of this, the present paper examines an international version of the CAPM, invokes it to estimate the cost of equity of a typical Australian company, and then compares the result to that arising from the widely used Officer (1994) version of the CAPM.

It is shown that the cost of equity under the former model is significantly less than under the latter model. The international version of the CAPM is also used to deduce the Australian MRP, although the latter plays no role in asset pricing if the international CAPM is valid.

International and Domestic CAPMs

The most widely used model for estimating the cost of equity capital in Australia seems to be that of Officer (1994)[1]. This model is a variant of the standard version of the CAPM (Sharpe, 1964; Lintner, Mossin, 1966) in which dividends are defined to include the value of imputation credits. Both of these models assume that national capital markets are completely segregated. Following the Officer

model, the cost of equity capital for an Australian asset j is:

$$k_j = R_f + MRP_A \beta_{jA} \quad (1)$$

where R_f is the Australian riskfree rate, β_{jA} is the beta of asset j against the Australian market portfolio and MRP_A is the market risk premium for Australia inclusive of dividend imputation credits.

By contrast with these models, there are numerous versions of the CAPM that assume integration of markets. The earliest version is that of Solnik (1974). We will examine this model because, dividend imputation aside, it closely parallels the Officer model (see Lally, 2000, section 2.3, for a survey of these international versions of the CAPM).

As with most international versions of the CAPM, international capital flows are assumed to be unrestricted and investors exhibit no irrational home country biases, i.e., there is no preference for local assets for non-financial reasons.

Like the standard version of the CAPM, it assumes that interest, dividends and capital gains are equally taxed. Following this model the cost of equity for an Australian asset (j) would be

$$k_j = R_f + MRP_w \beta_{jw} \quad (2)$$

where R_f is the Australian riskfree rate, $MRPw$ the market risk premium for the world, and β_{jw} the beta of asset j against the world market portfolio.

The difference between models (1) and (2) is in the definition of the market portfolio and the recognition or absence of imputation credits. However, if markets are integrated, then imputation credits will have little value and therefore their omission from (2) is appropriate. Thus models (1) and (2) differ essentially only in their definition of the market portfolio.

We now seek to estimate the cost of equity capital for a typical Australian company using both models (1) and (2). In respect of model (1), a typical Australian company will necessarily have a beta of 1. Furthermore the most widely used estimate for the market risk premium in this model seems to be 6%[2]. Using a riskfree rate of .06 the cost of equity for an average Australian stock would then be

$$k_e = .06 + .06(1) = .12$$

In respect of model (2) there are no widely accepted estimates of betas and the market risk premium because the model has not attained the widespread use of model (1).

We therefore seek to estimate the market risk premium and betas in model (2). We start with the market risk premium. Under this model, in which markets are assumed to be completely integrated, investors will now be holding a world rather than a national portfolio of equities, and the latter will have a considerably lower variance than that of most individual markets due to the diversification effect.

Since the market risk premium is a reward for bearing risk, then the world market risk premium under integration should be less than that for most countries under segmentation. Stulz (1995) argues that, if the ratio of the market risk premium to variance is the same across countries under segmentation, the same ratio will hold at the world level under integration and this fact should be invoked in estimating the world market risk premium.

Merton (1980) estimates the ratio at 1.9 for the US for the period 1926-78. Harvey (1991, Table VIII) offers estimates for 17 countries over the period 1970-90, which average 2.3. If we use the latter (higher) figure then this suggests a market risk premium for the Solnik CAPM of

$$MRP_w = 2.3\sigma^2_w \quad (3)$$

Cavaglia et al (2000, Table 3) estimates the world market variance over the period 1985-2000 as $.135^2$. Substitution of this variance into equation (3) then implies an estimate for the world market risk premium under complete integration of markets of

$$MRP_w = 2.3(.135^2) = .04 \quad (4)$$

It might seem that an alternative approach to estimating this market risk premium would be by historical averaging of the ex-post market risk premium over a long period, a practice widely used in estimating the market risk premium in model (1).

However, the integration of markets will lead to the world market risk premium declining[3]. Consequently the averaging process could only be applied to data from that point. This would leave only 25 years of data at most, and this would be insufficient to conduct the estimation.

Turning now to the question of betas, the average Australian stock has a beta against the Australian market portfolio of 1, by definition. Similarly, the average asset worldwide has a beta against the world market portfolio of 1, but this does not imply that the average Australian stock has a beta of 1 against the world market portfolio.

Ragunathan et al (2001, Table 1) provide beta estimates for a variety of Australian portfolios for the period 1984-1992, against both Australian and world market indexes. The average of the latter to the former is about .40[4]. In addition Gray (2000) regresses the Australian market index against a world index, for the period 1995-2000, and obtains a beta of .72.

The fact that these estimates are less than 1 is unsurprising in view of Australia's small weight in the world market index and the large weights for some markets. To illustrate this point, suppose the world comprised two equity markets with weights of .01 and .99. Also, suppose that the correlation between the two markets is .30 (Odier and Solnik, 1993) and they have the same variance. It follows that the small market (market 1) will have a beta against the world portfolio of

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$$\beta_{1w} = \frac{Cov\,(R_1,R_w)}{Var(R_w)} = \frac{Cov\,(R_1,.01R_1 + .99R_2)}{Var(.01R_1+.99R_2)} = .31$$

regardless of the value for the common variance.

The other market (market 2) will have a beta of 1.01 against the world portfolio (the weighted average of the two betas is of course 1). Lally (1996, Appendix 2) presents a more realistic example utilising actual county weights but the outcome is similar: ceteris paribus, very small markets tend to have betas against a world market portfolio that are much less than 1[5].

If we use Gray's (2000) estimate for the beta of the Australian market against the world market portfolio of .72, and insert this into Solnik's equation (2) along with a world market risk premium of .04 and an Australian riskfree rate of .06, the cost of equity for an average Australian stock would be:

k_e = .06 + .04(.72)= .089

If instead the Ragunathan et al (2001) estimate for the beta of the Australian market against the world market portfolio of .40 is used, then the cost of equity for the average Australian stock is even lower at .076.

These results are significantly less than the figure of .12 arising from the Officer model. Since the difference is so large, and the Officer model rests upon an assumption about segregation of national equity markets that is clearly false, then the Solnik model (or some other international CAPM) would appear to be more appealing. However the real test is which is the better description of how the expected returns on equities are determined.

All direct tests of this question suffer from the Roll (1977) problem, in which the use of mere proxies for the true market portfolio may induce significant test biases.

However less direct tests can be performed. One of these is to examine investors' portfolios. The Solnik model implies that all investors will hold risky assets (both foreign and local) in proportion to their market values. Consequently the ratio of domestic to total worldwide equities held by investors in a particular country should be equal to that country's weight in the world market portfolio.

Clearly this is not the case, with investors exhibiting pronounced home country bias. Coen (2001, Table 1) summarises results for nine large markets and finds that the ratio of domestic to total worldwide equities held by investors exceeds the market's weight by a substantial margin in all cases (the average ratio is 82%, compared to an average market weight of 11%). Not all international versions of the CAPM have the same implications for investor portfolio holdings, but none can be readily reconciled with this overwhelming home country bias (Huberman, 2001).

In view of this significant difficulty, it is understandable that analysts in

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Australia and elsewhere have not (yet) invoked international CAPMs in estimating the cost of equity capital. Furthermore, until home country bias is significantly ameliorated, such caution is likely to persist.

Nevertheless, in so far as some recognition is given to international influences on the cost of equity for Australian companies, the effect should be to reduce the cost of equity.

The Australian MRP under Integration

If the Australian market is integrated with world markets, so that Solnik's model (2) is valid, then this model implies a value for the Australian MRP as follows. Solnik's equation (2) can be used to determine the expected return in equilibrium of any asset or portfolio. One such portfolio is the Australian market portfolio, with expected return k_A:

$$k_A = R_f + MRP_w \beta_{Aw}$$

Subtracting the Australian riskfree rate R_f from k_A then yields the Australian MRP, i.e.,

$$MRP_A = k_A - R_f = MRP_w \beta_{Aw}$$

So, if the Solnik model is correct, then the Australian MRP is the product of the world MRP and the beta of the Australian market portfolio against the world market portfolio. Using the earlier estimate of .04 for the world market risk premium, and an estimate for the beta of .60, the resulting estimate for the Australian MRP under integrated markets is

$$k_A - R_f = .04(.60) = .024$$

However it must be stressed that this MRP cannot be used to determine the expected return for any particular Australian stock, i.e. it cannot be inserted into equation (1). If Solnik's model is valid then the expected return for any particular Australian stock is determined by Solnik's model (2) and the Australian MRP plays no role whatsoever in that model. The latter is simply an output of the Solnik model rather than an input into a CAPM.

Summary

Standard practice in Australia is to estimate the cost of equity using the Officer version of the CAPM, and this model assumes inter alia that the Australian market is completely segregated from other equity markets.

Clearly the Australian market is integrated to some degree with world markets, although the degree is open to debate. This paper shows that, if the Australian market was completely integrated with world markets, then the effect would be to lower the cost of equity for a typical Australian stock by three to five percentage points. Thus, in so far as one gives some recognition to integration, then the result should be to lower the cost of equity for the typical Australian company.

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NOTES

1 Examples of textbooks that have adopted this CAPM are Bishop et. al. (1993, Ch. 16) and Peirson et al (1998, Ch. 15). The reports of the utility regulatory authorities in Victoria and New South Wales also reveal general acceptance of the model for utility rate setting, not only by the authorities but also by the entities affected and by their financial advisors. In addition anecdotal evidence that the author is aware of, along with their own casual observations, both suggest a high degree of acceptance of the Officer approach for applications in the private sector.

2 The ACCC (2000, p 22) surveys views on this matter and concludes with a figure of .06. This is a little less than the average over the last 100 years, of .07 (Dimson et al, 2000).

3 For example, suppose that all markets have the same variance of .03 (this is a value weighted average of the estimates in Cavaglia, 2000, Table 1). Assuming as above that they have the same ratio of MRP to variance under market segregation (of 2.3) then they will have the same MRP of .069. The world MRP is a value weighted average of that for individual countries, and therefore must equal this common value of .069. Now suppose that integration occurs and that the variance of the world market portfolio is $.135^2 = .018$ as above. The world MRP is then .04 as above. This is significantly less than the world MRP when markets were segregated (of .069). The reason is simply that the world portfolio has a lower variance than most individual markets, due to the effect of diversification.

4 Bryant and Eleswarapu (1997, Table 5) conduct a similar analysis for New Zealand stocks and find an average reduction of 30% when shifting from national to world betas.

5 This is a kind of "size effect" for betas. It also applies to individual stocks within markets, and exerts considerable effect upon the betas of firms as their market weight varies (Lally and Swidler, 2002). J