INTERNATIONAL JOURNAL OF BUSINESS, 8(4), 2003 ISSN:1083-4346

The Effect of Asymmetric Information on the Cost of Capital

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ABSTRACT

In this paper we propose a new method to compute the cost of capital in domestic and in international settings. Our formulas show the effect of information costs on the cost of capital and give the conditions under which the domestic and the international approach yield the same results in the presence of this imperfection. Information costs are defined within the context of Merton's (1987) model of capital market equilibrium with incomplete information, CAPMI. We argue that the cost of capital in small countries should be estimated using a global CAPMI rather than a local CAPMI. Our simulation results show that the error on the cost of capital for small firms is greater than the large one.

JEL: G3, G15, G31, G32

Keywords: Cost of capital ; Information costs ; Local CAPM ; Global CAPM

I. INTRODUCTION

Despite the considerable controversies surrounding the capital asset pricing model of Sharpe (1964), most valuation approaches in the USA take the CAPM as given and compute the discount rate for equity cash flows. In small countries, academics mimic US practices and use the CAPM with a broad based local index as a proxy for the home country market portfolio. This is referred to as the local CAPM. In Stulz (1995a), the global CAPM refers to the implementation of the standard CAPM with a broad based global index proxying for the collective wealth of countries with easily accessible capital markets for investors who live in any of these countries.

As it appears in the keynote speech of Stulz (1995b), most computations of the cost of capital use the CAPM applied to individual countries as if capital markets were not integrated. In that speech, the main question is to know whether the cost of capital differ for firms located in different countries. The cost of capital refers to a hurdle rate that a project must earn for owners of a firm not to suffer a wealth loss if the project is taken. The definition of this hurdle rate in the neoclassical sense ignores the presence of agency costs. In this spirit, Stulz (1995b) argues that projects that satisfy the neoclassical hurdle rate can destroy shareholder wealth in firms with high agency costs.

As it is well known, the CAPM assumes costless information. Or, as it appears in Merton's (1987) model of capital market equilibrium with incomplete information, CAPMI, this model can better explain the expected returns and some anomalies in financial markets. The type of incomplete information in Merton's (1987) model has something to do with agency costs. Therefore, using the CAPMI can lead to a better estimation of the cost of capital than the standard CAPM since the CAPMI accounts for shadow costs of incomplete information.

Merton (1987) adopts most of the assumptions of the original CAPM and relaxes the assumption of equal information across investors. Besides, he assumes that investors hold only securities of which they are aware. This assumption is motivated by the observation that portfolios held by actual investors include only a small fraction of all available traded securities. The main distinction between Merton's (1987) model and the standard CAPM is that investors invest only in the securities about which they are "aware". This assumption is referred to as incomplete information. However, the more general implication is that securities markets are segmented. The main intuition behind this result is that the absence of a firm-specific risk component in the CAPM comes about because such risk can be eliminated (through diversification) and is not priced. It appears from Merton's model that the effect of incomplete information on expected returns is greater the higher the firm's specific risk and the higher the weight of the asset in the investor's portfolio. The effect of Merton's non market risk factors on expected returns depend on whether the asset is widely held or not.

The CAPMI can be used in the reexamination of corporate risks under incomplete information and in particular in the computation of the cost of capital as in Bellalah (2001). Following Stulz (1995a), we can define in the same spirit a local CAPMI and a global CAPMI. We study the use of the CAPMI for small countries. Since several markets are today accessible, the cost of capital in small countries is not

determined locally but globally. We present a formula to show the magnitude of the mistake made if the local CAPMI is used instead of a global CAPMI.

The paper is organized as follows: Section II studies the effect of incomplete information in domestic and global markets on the cost of capital. It is assumed that information costs are similar for domestic and foreign investors. Section III investigates the impact of differential shadow costs of incomplete information on the cost of capital. It is assumed that information costs are different for domestic and foreign investors.

II. THE EFFECT OF INCOMPLETE INFORMATION IN DOMESTIC AND GLOBAL MARKETS ON THE COST OF CAPITAL

This section provides expressions for the cost of capital when it is determined locally and when it is determined globally in the presence of shadow costs of incomplete information. These shadow costs reflect in some sense the asymmetric information problems and agency costs as in Stulz (1995b). These costs are documented in several studies including Kang and Stulz (1997), Brennan and Cao (1997), Coval and Moskowitz(1999), Bellalah (2001), etc. The use of Merton's (1987) model in the computation of the cost of capital offers an appropriate method to account for these shadow costs in an international setting.

A. Market Segmentation and Incomplete Information

Consider a firm *i* in a small country (the home country) referred to as country *H*. When investors in the home country cannot invest abroad and foreign investors cannot invest in the home country, this situation refers to a segmented market case. In the absence of taxes, transaction costs and other markets imperfections within countries, the CAPMI can be used. We consider that capital markets are segmented and that the economy is characterized by incomplete information as in Merton (1987). In this context, the CAPMI of Merton (1987) applies within the home country and the required expected return on shares of firm *i* is given by:

$$E(R_{iH}) = r + \lambda_i + \beta_{iH}(E(R_H) - r - \lambda_H) \quad (1)$$

where $E(R_{iH})$: the expected rate of return of asset *i* when the domestic market portfolio is used; $E(R_H)$: the expected rate of return of the domestic market portfolio; $\beta_{iH} = \frac{cov(R_i, R_H)}{var(R_H)}$: the beta of asset *i* when the domestic market portfolio is used; λ_i: the shadow cost of incomplete information for asset *i*; λ_H: the shadow cost of incomplete information for the domestic market; r: the domestic risk free rate of interest.

If Equation (1) is used in the computation of the cost of capital, this is equivalent to mimicking the US approach. This means that the home country is assumed to be isolated from the rest of the world. In the opposite, if the market portfolio comprises all

markets that are freely accessible for investors of the home country, the market portfolio refers to a global market portfolio. Equation (1) can be used for example to value a company in France using as the market portfolio a proxy like the CAC 40 or the Morgan Stanley Capital International (MSCI) index for France. Equation (1) is not very appropriate for any capital market that is not isolated from the other markets.

B. Market Integration and Incomplete Information

When home country investors can access foreign capital markets and investors in these countries can access the market of the home country, all these markets represent one capital market or a global capital market. For example, the French market is not segmented from the world and it seems more appropriate to calculate the cost of capital of the French companies by a global CAPMI.

Under the same assumptions used in Stulz (1995a), it is possible to write Merton's (1987) model for the computation of the cost of capital :

$$E(R_{iG}) = r + \lambda_i + \beta_{iG}(E(R_G) - r - \lambda_G) \tag{2}$$

where: $E(R_{iG})$: the expected rate of return of asset *i* when the global market portfolio is used; $E(R_G)$: the expected rate of return of the domestic market portfolio; $\beta_{iG} = \frac{cov(R_i, R_G)}{var(R_G)}$: the beta of asset *i* when the global market portfolio is used; λ_i : the shadow cost of incomplete information for asset *i*; λ_G : the shadow cost of incomplete information for the global market; r : the domestic risk free rate of interest

Equation (2) can be used for example to value a company in France using as the market portfolio a proxy like the MSCI World index. In relations (1) and (2), it is assumed that the shadow cost of incomplete information about the firm *i* is the same for the domestic and the international investor. In the next section, we will relax this assumption and explain how it affects the results. This is because information costs can be higher or at least different for foreign investors.

When the home country is integrated in world capital markets, the expected return on the market portfolio of the home country is computed using equation (2):

$$E(R_H) = r + \lambda_H + \beta_{HG}(E(R_G) - r - \lambda_G) \tag{3}$$

where $\beta_{HG} = \frac{cov(R_H, R_G)}{var(R_G)}$

Equation (3) gives the risk premium on the home country market portfolio when the country is integrated in global markets. Inserting relation (3) into (1) gives:

$$E(R_{iHG}) = r + \lambda_i + \beta_{iH}\beta_{HG}(E(R_G) - r - \lambda_G) \tag{4}$$

where the subscript *iHG* refers to the required return obtained for security *i* when markets are global and the local CAPMI is used.

Relation (4) gives the cost of capital when the markets are global but the domestic market index is used. This relationship is different from that in Stulz (1995a) due to the effect of incomplete information regarding the firm and the global market. The domestic CAPMI and the global CAPMI give the same results only if:

$$E(R_{iG}) - E(R_{iHG}) = 0$$

Using equations (2) and (4), we obtain:

$$E(R_{iG}) - E(R_{iHG}) = (\beta_{iG} - \beta_{iH}\beta_{HG})(E(R_G) - r - \lambda_G) \quad (5)$$

Relation (5) shows that the information cost on the global market decreases the risk premium. Since this premium on the global market portfolio is positive, the global CAPMI and the local CAPMI give the same cost of capital of firm *i* when $\beta_{iG} = \beta_{iH}\beta_{HG}$. When the return on the home country portfolio is always equal to the return of the global portfolio, the local CAPMI and the global CAPMI approaches give the same result when $\beta_{iG} = \beta_{iH}\beta_{HG}$.

In relation (5), we can get a risk premium in the global market equal to zero if the information cost in global market is equal to the excess return on the global market; that is when $E(R_G) - r = \lambda_G$.

Table 1

Effects of λ_G and β_{iG} on error on the cost of capital. $r = 3\%$, $\beta_{iH} = 0{,}75$, $\beta_{HG} = 0{,}5$ and $E(R_G) = 4{,}5\%$.

λ_G	β_{iG}	Error on the cost of capital (%)
	0.3	0.11
3%	0.5	-0.19
	0.7	-0.49
	0.3	0.26
5%	0.5	-0.44
	0.7	-1.14
	0.3	0.41
7%	0.5	-0.69
	0.7	-1.79
	0.3	0.56
9%	0.5	-0.94
	0.7	-2.44

The case where the global information cost exceeds the risk premium in global market remains possible, due to the effect of incomplete information in an international setting.

Simulation results for error on cost of capital are reported in table 1. The parameters value used are $r = 3\%$, $\beta_{iH} = 0{,}75$, $\beta_{HG} = 0{,}5$ and $E(R_G) = 4{,}5\%$. Table 1 shows the effects of the shadow cost of incomplete information of the global market (λ_G) and the beta of assets when the global market portfolio is used (β_{iG}) on error on cost of capital. When λ_G increases, the error on cost of capital increases. For instance, when $\beta_{iG} = 0{,}5$, as λ_G increases from 3% to 7%, the error on the cost of capital increases of about 0,5%. It is also apparent from Table 1 that the error increases with β_{iG}.

III. THE DIFFERENCE IN INFORMATION COSTS BETWEEN DOMESTIC AND GLOBAL MARKETS AND THEIR EFFECTS ON THE COST OF CAPITAL

In the previous section, we assume that information costs supported by home investors are of the same magnitude as the costs supported in global markets. Now, we consider the case where the information costs supported by the domestic investors are different from those paid by the foreign investors. This may be a reasonable assumption because there are in general some additional costs to access to information about foreign markets. In the case of market segmentation, the cost of capital can be computed using the following relationship :

$$E(R_{iH}) = r + \lambda_{iH} + \beta_{iH}(E(R_H) - r - \lambda_H) \tag{6}$$

where λ_{iH} is the information cost of asset *i* in the domestic market .

If we consider the case where the markets are integrated, the information cost paid by the international investor will differ from the one paid by the domestic one. This suggestion is consistent with the empirical evidence since domestic investors are in general better informed about their markets than foreign investors.

In the case of market integration, the cost of capital can be calculated under incomplete information using:

$$E(R_{iG}) = r + \lambda_{iG} + \beta_{iG}(E(R_G) - r - \lambda_G) \tag{7}$$

where λ_{iG} indicates the information cost of asset *i* in the global market. Since the international markets are integrated, relation (3) holds. Inserting relation (3) into (6) gives:

$$E(R_{iHG}) = r + \lambda_{iH} + \beta_{iH}\beta_{HG}(E(R_G) - r - \lambda_G) \tag{8}$$

In a domestic and an international setting, the global and domestic markets yield the same result under information uncertainty when $E(R_{iG}) = E(R_{iHG})$.

From Equations (7) and (8), we obtain:

$$E(R_{iG}) - E(R_{iHG}) = (\lambda_{iG} - \lambda_{iH})(\beta_{iG} - \beta_{iH}\beta_{HG})(E(R_G) - r - \lambda_G) \quad (9)$$

Relation (9) reflects the important effect of incomplete information on the cost of capital. Expression (9) shows that the cost of capital depends not only on the domestic index and the global index but also on the information cost in the domestic and the global market. The cost of capital is the same in the two contexts if:

$$(\lambda_{iH} - \lambda_{iG}) = (\beta_{iG} - \beta_{iH}\beta_{HG})(E(R_G) - r - \lambda_G) \quad (10)$$

If we consider a positive risk premium on the global market in the case of complete information, we get the same result as in Stulz (1995): $\beta_{iG} = \beta_{iH}\beta_{HG}$. If the information cost in the domestic market is the same as the information cost in global market $\lambda_{iG} = \lambda_{iH} = \lambda_i$, we obtain the same condition as the one in the previous section of this paper.

Table 2

Effects of λ_{iG} and β_{iG} on error on the cost of capital in case of different information cost. $r = 3\%$, $\lambda_{iH} = 0{,}5\%$, $\beta_{iH} = 0{,}75$, $\beta_{HG} = 0{,}5$ and $E(R_G) = 4{,}5\%$.

λ_{iG}	β_{iG}	Error on the cost of capital (%)
	0.3	-0.04
0,5%	0.5	0.06
	0.7	0.16
	0.3	0.46
1%	0.5	0.56
	0.7	0.66
	0.3	1.46
2%	0.5	1.56
	0.7	1.66
	0.3	2.46
3%	0.5	2.56
	0.7	2.66

Table 2 shows the effects of λ_{iG} and β_{iG} on error on cost of capital. When λ_{iG} increases, the error on cost of capital increases. For example, when $\beta_{iG} = 0,5$, as λ_{iG} increases from 1% to 3%, the error on the cost of capital increases of about 2%. It is also apparent from table 1 that the error increases with β_{iG}.

In international setting the information costs are more important than in domestic case. Tables 1 and 2 show that the information costs are more important for an international investor than the domestic one ($\lambda_{iG} > \lambda_{iH}$). Kang and Stulz (1997) have shown that the information costs are higher for small firms than the large one. From our simulations we expect that the error on the cost of capital for small firms are greater than the large one. This conclusion justifies the fact that we have a difficult to get information about small firms.

We conclude that the appropriate way to compute the cost of capital in international and domestic setting in the case of incomplete information is to determine the optimal conditions on the beta and the information costs for domestic and international investors.

IV. CONCLUSION

Following the analysis in Stulz (1995a), this paper shows that the cost of capital in small countries is determined globally and not locally in the presence of incomplete information. Information uncertainty is defined with respect to Merton's (1987) simple model of capital market equilibrium with incomplete information, CAPMI. The analysis implies that the valuation approaches in small countries should be based on a global capital asset pricing model as the CAPMI rather than a local CAPMI. In both, cases, the cost of capital must account for the effects of shadow costs of incomplete information. Further research can be done to quantify the magnitude of the mistake made using a local CAPMI rather than a global CAPMI.

The neo-classical cost of capital and the agency-adjusted cost of capital in the presence of incomplete information can provide different answers as to whether the cost of capital differ between countries. Our analysis extends the standard analysis in Stulz (1995a, 1995b) to account for the effects of incomplete information in the computation of the cost of capital.

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