THE EFFECT OF ASYMMETRIC INFORMATION AND TRANSACTION COSTS ON ASSET PRICING : THEORY AND TESTS

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This paper presents a capital asset pricing model in the presence of asymmetric information and transaction costs. The model is a generalized version of Merton's (1987) model and Black's (1974) model. Empirical tests show a negative relation between the expected rate of return and the shadow costs of incomplete information. The results in this paper have the potential to explain the home bias equity in a domestic and an international context.

1 INTRODUCTION

Market imperfections are important elements in capital asset pricing models in a domestic setting (Mayshar (1979, 1980)) and in an international setting (Black (1974), Stulz (1981)).

Transaction costs and asymmetric information are potential factors that explain the home bias equity in domestic and international financial markets. Using the model in Black (1974), Lewis (1999) shows the effect of transaction costs on portfolio choice in the case of two country model.

Cooper and Kaplanis (1994) extend the model of Adler and Dumas (1983) by incorporating a tax similar to that in Black (1974). Cooper and Kaplanis (1994) show that the home bias can be explained by deadweight costs (transaction costs or tax) and not by the inflation risk as suggested by Adler and Dumas (1983).

Cooper and Kaplanis (2000) extend the model of Stulz (1981) to the case of N countries and show how deadweight costs affect the portfolio choice and the capital budgeting decisions.

The effect of market imperfections is used as an argument to explain the market segmentation or/and integration. Market imperfections such as transaction costs and taxes suggest that financial markets are not efficient and explain some observed anomalies.

This paper develops an asset pricing model which accounts for the effect of asymmetric information and transaction costs.

The model explains the effect of market imperfections on the expected return and shows how these frictions explain the home bias equity. We develop an empirical tests in order to explain the relationship between the expected rate of return, the transaction costs and the information costs.

This paper is organized as follows. Section 2 presents the importance of transaction costs, taxes and asymmetric information in portfolio choice. Section 3 develops a model that incorporates the effects of asymmetric information about assets and the transaction costs. Section 4 provides some empirical evidence. Finally, we conclude and provide some suggestions for future research.

2 The E®ect on Portfolio Choice of Asymmetric Information and transaction costs

The gain from international diversi¯cation were documented by Grubel (1968), Levy and Sarnat (1970), Solnik (1974a), Gerard and De Santis (1997) and others.

Tesar and Werner (1995) ¯nd a strong evidence of a home bias in national investment portfolios. They explain the home bias by transactions costs. They suggest that the best explanation of this bias should be based on asymmetric information.

Hasan and Simaan (2000) develop a model that incorporates both the forgone gains from diversi¯cation and the informational constraints of international investments. This model is a generalization of French and Poterba (1991). These authors show that the lack of diversi¯cation appears to be the result of investor choices rather than institutional constraints.

Kadalec and Mcconnell (1994) show that the change in share value is attributed to investor recognition factor as suggested by Merton (1987).

Forester and Karolyi (1999) show that the abnormal returns can be explained by the asymmetric information. In this model the empirical tests provide support for market segmentation hypothesis and Merton's (1987) investor recognition hypothesis. Forester and Karolyi (1999) and Kadalec and Mcconnell (1994) use a sample from US exchanges for an investor who trade in local market by constructing a diversi¯ed portfolio from securities of forgein ¯rms listed in US exchange.

Asymmetric information is very important in a national and an international setting. Brennan and Cao (1997) develop a model of international equity portfolio investment °ows based on informational endowments between foreign and domestic investors. They show that when domestic investors hold an information advantage over foreign investors about their domestic market, investors tend to purchase foreign assets in periods when the return in foreign assets is high.

The e®ects of taxes and transaction costs on asset pricing are presented the ¯rst time by Black (1974) on a model where the investor is imposed on his holding. Black (1974) shows that the taxes discourage some investors to

invest in some assets and in other countries.

Stulz (1981) proposes a model in which it is costly for the domestic investors to hold foreign assets. He shows that due to the existence of these costs some assets are not traded and the domestic investors tend to hold more in their domestic securities which explain the home bias equity.

Whatley (1988) develops a consumption-based asset pricing model which incorporates a tax as Black (1974) and Stulz (1981). He shows that there is a little evidence about market integration due to these costs.

Falkenstein (1996) explains that the preference for some assets is explained by the low transaction costs and low volatility. He shows that the investors tend to trade on the assets about which they are informed. In his model, the information is detected by the investors through the publication of the new stories and the age of these assets.

We develop in the next section a model of asset pricing in the presence of transaction costs and information costs. We show that the two market imperfections in the asset pricing have the same rule and they are very important in theoretical and practical activity on the market.

This paper shows that the two imperfections are not the same as suggested in the literature, which considers the transaction costs as information costs. We consider that the information costs as indirect costs but the transaction costs as direct costs.

The presence of these costs shows that in equilibrium, the market portfolio is not e±cient, and that the portfolio choice of an investor depends on these variables.

3   THE MODEL

We develop a two-period model of asset pricing in an environment where each investor knows only about a subset of the available securities.

The equilibrium return of security k follows the equation:

$$R_k = \overline{R}_k + b_k Y + \frac{3}{4}_k \ddot{}_k \tag{1}$$

with:

$\overline{R}_k$: the expected rate of return of security k;

Y : denotes a random variable common factor with;

$$E(Y) = 0$$

$$E(Y^2) = 1$$

$$E(\varepsilon_k = \varepsilon_1, \varepsilon_2 \cdots \varepsilon_{k-1}, \varepsilon_{k+1} \cdots \varepsilon_n, Y) = 0 \text{ for } k = 1, 2, 3, 4 \cdots n$$

By inspectation of (1), the structure of return is like the Sharpe (1964) diagonal model or the one factor version of the Ross (1976) Arbitrage pricing theory and Merton's (1987) model.

In addition to the n risky securities, we consider two other traded securities, a riskless security with sure return and a security that combines the riskless security and forward contract on the observed factor.

We assume that the forward price of the contract is that the standard deviation of the equilibrium return on the security is unity. The rate of return on this security is given by:

$$R_{n+1} = \overline{R}_{n+1} + Y \tag{2}$$

We assume that investors' aggregate demand for this security as well as the riskless security must be zero in equilibrium. The model assumes the existence of transaction costs or taxes as Black (1974) and Lewis (1999) when we trade on security k.

Borrowing and short selling without restrictions.

Investors are risk averse and select an optimal portfolio according to the Markowitz - Tobin (1959) mean-variance criterion applied to the end of period wealth. The preference of investor j is represented as :

$$U^j = E(R^j W^j) - \frac{\pm^j}{2W^j} Var(R^j W^j) \tag{3}$$

with:

W^j : the wealth of investor j;

R^j : the return on his portfolio of investor j;

$\pm^j \geq 0$; for $j = 1, 2, 3 \cdots N$.

We call J^j a collection of integers such that the security k is an element of J^j if investor j is informed about this asset, with $k = 1, 2, 3 \cdots n$.

We assume that the security $(n+2)$ is the riskless security and the $(n+1)$ security are contained in J^j. With the structure of the model established, we turn now to the solution of the portfolio selection problem for investor j.

Let w_k^j be the fraction of initial wealth allocated to security k by investor j.

The return on portfolio for an investor j in the presence of transaction costs can be written as follows :

$$R^j = \sum_{k=1}^{n} w_k^j(R_k \; ¿_k) + w_{n+1}^j R_{n+1} + w_{n+2}^j R \tag{4}$$

Inserting (1) and (2) in (4) we get:

$$R^j = \sum_{k=1}^{n} w_k^j(\overline{R}_k + b_k Ɏ + ¾_k \overset{..}{}_k \; ¿_k) + w_{n+1}^j(\overline{R}_{n+1} + Ɏ) + w_{n+2}^j R \tag{5}$$

where :
$¿_k$: the transaction costs paid by investor j on asset k.
Equation (5)can be written as :

$$R^j = \sum_{k=1}^{n} w_k^j(\overline{R}_k \; ¿_k) + (\sum_{k=1}^{n} w_k^j b_k + w_{n+1}^j) Ɏ + \sum_{k=1}^{n} w_k^j ¾_k \overset{..}{}_k + w_{n+1}^j \overline{R}_{n+1} + w_{n+2}^j R \tag{6}$$

Let:

$$\sum_{k=1}^{n} w_k^j b_k + w_{n+1}^j = b^j \tag{7}$$

and

$$\sum_{k=1}^{n+2} w_k^j = 1 \tag{8}$$

From (7) and (8), we can write (6) as follows:

$$R^j = \sum_{k=1}^{n} w_k^j \overline{R}_k \; \sum_{k=1}^{n} w_k^j ¿_k + b^j Ɏ + \sum_{k=1}^{n} w_k^j ¾_k \overset{..}{}_k + (b^j \; \sum_{k=1}^{n} w_k^j b_k)\overline{R}_{n+1} \tag{9}$$

$$+(1 \; b^j + \sum_{k=1}^{n} w_k^j b_k \; \sum_{k=1}^{n} w_k^j)R$$

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With the properties of Y and ε_k, we can write the variance of the portfolio of investor j as follows:

$$Var(R^j) = b^{j^2} + \sum_{k=1}^{n} (w_k^j)^2 \sigma_k^2 \qquad (10)$$

If we look to equation (10), we see that the variance of the portfolio of investor j is characterized by the common factor risk $(b^j)^2$ and the risk of all assets contained in the portfolio.

   Let us derive the expected rate of return on portfolio of investor j. This can be done by using equation (9):

$$E(R^j) = \sum_{k=1}^{n} w_k \overline{R}_k + b^j E(Y) + \sum_{k=1}^{n} w_k^j \sigma_k E(\varepsilon_k) - \sum_{k=1}^{n} w_k^j c_k + b^j \overline{R}_{n+1} \qquad (11)$$

$$- \sum_{k=1}^{n} w_k^j b_k \overline{R}_{n+1} + R - b^j R + \sum_{k=1}^{n} w_k^j b_k R - \sum_{k=1}^{n} w_k^j R$$

Using (11) the expected rate of return on a portfolio for investor j is:

$$\overline{R}^j = R + b^j(\overline{R}_{n+1} - R) + \sum_{k=1}^{n} w_k^j \left[\overline{R}_k - c_k - R - b_k(\overline{R}_{n+1} - R) \right] \qquad (12)$$

This expression shows that the transaction costs decrease the expected rate of return of the portfolio of investor j. We can write the expression (12) as follows:

$$\overline{R}^j = R + b^j(\overline{R}_{n+1} - R) + \sum_{k=1}^{n} w_k^j \phi_k$$

with:

$$\phi_k = \overline{R}_k - c_k - R - b_k(\overline{R}_{n+1} - R)$$

   From equation (3), the optimal portfolio choice for the investor can be formulated as a solution to the constrained maximization problem:

$$\max_{b^j; w_k^j} \left[\overline{R}^j - \frac{\tau^j}{2} Var(R^j) - \sum_{k=1}^{n} \gamma_k^j w_k^j \right] \qquad (13)$$

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where:

γ_k^j is Lagrange multiplier that reflects the constraint that investor j can not invest in security k if he does not have an information about this security. From this interpretation, we have:

$$\gamma_k^j = 0 \text{ if } k \in J^j \tag{14}$$

This condition means that the investor is informed about security k.

$$w_k^j = 0 \text{ if } \quad k \in J^{j\,c} \tag{15}$$

From the optimization problem given by relation (13) and from relation (12) and (10) we obtain the first-order conditions that give the optimal common factor and portfolio weights for investor j:

$$\frac{@U^j}{@b^j} = \overline{R}_{n+1} - R - \lambda^j b^j = 0 \tag{16}$$

$$\frac{@U^j}{@w_k^j} = \mathcal{C}_k - \lambda^j w_k^j \sigma_k^2 - \gamma_k^j \tag{17}$$

From (16), we can write:

$$\frac{\overline{R}_{n+1} - R}{\lambda^j} = b^j \tag{18}$$

Relation (18) represents the common factor exposure (political risk for example) that affects the portfolio of investor j.
Using relation (17), we have:

$$w_k^j = \frac{\mathcal{C}_k - \gamma_k^j}{\lambda^j \sigma_k^2} \tag{19}$$

Using (14) relation (19) becomes for an informed investor:

$$w_k^j = \frac{\mathcal{C}_k}{\lambda^j \sigma_k^2} \tag{20}$$

Relation (20) shows that investor j invests only in securities he knows about and that the fraction allocated to security k depends on the required return, the risk and the transaction costs.
If the investor does not have any information about security k, then his

proportion invested in this security is equal to zero. From equation (19) we get:

$$\Phi_k = {}_{s}^{j}k \quad \text{if} \quad k \, 2 \, J^{j\,c} \tag{21}$$

Up to now we have solved for individual optimal demands. We now aggregate to determine equilibrium asset prices and expected returns. We simplify the analysis and focus on the e®ect of transaction costs and incomplete information on equilibrium prices. Assuming that the representative investors have identical preferences and the same initial wealths, then we can write:

$$\pm^j = \pm \, 8 \, j$$

and

$$W^j = W; j = 1; 2; 3; :::::; N$$

Under these assumptions it follows that all investors choose the same exposure to the common factor, $b^j = b$ for $j = 1; 2; 3::::::; N$. Relation (16) becomes :

$$\overline{R}_{n+1} = R + b\pm \tag{22}$$

Let D_k be the aggregate demand for security k by investors:

$$D_k = \sum_{j=1}^{N} w_k^j W^j \tag{23}$$

With our assumptions that investor j, invests only in the securities that he has information about, equation (23) becomes with reference to (15) and (20):

$$D_k = \frac{N_k W \, \Phi_k}{\pm\frac{3}{4}_k^2} \tag{24}$$

with:
N_k : the number of investors who have information about security k.
When all investors know about the security k, then $N_k = N$.
Let x_k be the fraction of the market portfolio invested in security k, then we write :

$$x_k = \frac{D_k}{M} \tag{25}$$

where M denotes the equilibrium national wealth:

$$M = \sum_{j}^{N} W^j \tag{26}$$

In reality, not all investors know about the security k. That's why we can give the fraction of all investors who have information about security k as :

$$q_k = \frac{N_k}{N} \tag{27}$$

The value of q_k varies between zero and one, $0 < q_k \cdot 1$. This fraction is greater than zero because there is an investor who is informed about security k.

When this fraction is equal to one, then all investors have the same information about security k.

From equations (24), (26), (27), equation (25) allows to write:

$$x_k = \frac{q_k \phi_k}{\pm \frac{3}{4}_k^2} \tag{28}$$

Because the market portfolio is a weighted average of optimal portfolios and because all investors choose the same common factor exposure (b^j), it follows that (b^j) = b.

We assume that assets (n+1) and (n+2) are inside securities. We can write $b = \sum_{k}^{n} b_k$. In addition we have :

$$\phi_k = \overline{R}_k \; i \; R \; i \; \dot{c}_k \; i \; b_k(\overline{R}_{n+1} \; i \; R)$$

Inserting (18) in the expression of ϕ_k, we obtain:

$$\phi_k = \overline{R}_k \; i \; R \; i \; \dot{c}_k \; i \; b_k \pm^j b^j \tag{29}$$

Since $b = b^j$ and $\pm = \pm^j$, equation (29) becomes :

$$\phi_k = \overline{R}_k \; i \; R \; i \; \dot{c}_k \; i \; b_k b\pm \tag{30}$$

From (30), we have:

$$\overline{R}_k = R + \dot{c}_k + b_k b\pm + \phi_k \tag{31}$$

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From (28) the expression of $\mathcal{C}_k$ is given by :

$$\mathcal{C}_k = \frac{x_k}{q_k} \pm \frac{3}{4}_k^2 \tag{32}$$

Inserting (32) in (31) we obtain :

$$\overline{R}_k = R + \dot{c}_k + b_k \pm b + \frac{x_k}{q_k} \pm \frac{3}{4}_k^2 \tag{33}$$

To see the connection between the e®ects of transaction costs and the shadow cost of incomplete di®usion of information among investors, let:

$$_\beta k = \frac{\overset{P}{N}_{j=1} \, \beta^j_k}{N} \tag{34}$$

be the equilibrium aggregate shadow cost per investor.
From relation (21), equation (34) becomes :

$$_\beta k = \frac{N \, \dot{i} \, N_k}{N} \mathcal{C}_k \tag{35}$$

Relation (35) can be written as :

$$_\beta k = (1 \, \dot{i} \, \frac{N_k}{N}) \mathcal{C}_k \tag{36}$$

From (27), relation (36) becomes:

$$_\beta k = (1 \, \dot{i} \, q_k) \mathcal{C}_k \tag{37}$$

Let R_M be the return on the market portfolio :

$$R_M = \overset{X^n}{\underset{k=1}{}} x_k R_k \tag{38}$$

We assume that the securities $(n + 1)$ and $(n + 2)$ are inside securities so that x_{n+1} and x_{n+2} are equal to zero.
From relation (10), we obtain the variance of the market portfolio as follows:

$$V ar(R_M) = b^2 + \overset{X^n}{\underset{n=1}{}} x_k^2 \frac{3}{4}_k^2 \tag{39}$$

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The examination of the variance of the market portfolio shows that there are two sources of risk: a risk characterizing the common factor, and the risk of every asset k.

If we define the beta of security k as $\bar{\beta}_k$: the covariance of return on security k with the market portfolio divided by the variance of the market portfolio return, then we have :

$$\bar{\beta}_k = \frac{bb_k + x_k \sigma_k^2}{Var(R_M)} \tag{40}$$

for: $k = 1, 2, ...n.$

With reference to relation (37), we have:

$$\mathbb{C}_k = \lambda_k + q_k \mathbb{C}_k \tag{41}$$

Inserting (41) in (31) we obtain :

$$\overline{R}_k = R + \xi_k + b_k \pm b + \lambda_k + q_k \mathbb{C}_k \tag{42}$$

The substitution of (32) in (42) gives:

$$\overline{R}_k = R + \xi_k + b_k b \pm + \lambda_k + x_k \pm_k \sigma_k^2 \tag{43}$$

From this relation, we try to get the covariance expression :

$$\overline{R}_k = R + \xi_k + \pm_k (b_k b + x_k \sigma_k^2) + \lambda_k \tag{44}$$

If we multiply (44) by x_k and sum from $k = 1, 2, ..., n$, keeping in mind that the securities $(n + 1)$ and $(n + 2)$ are inside securities, then $x_{n+1} = 0$ and $x_{n+2} = 0$.

Equation (44) becomes:

$$\overline{R}_M = R + \sum_{k=1}^{n} x_k \xi_k + \pm \left(\sum_{k=1}^{n} x_k b_k b + \sum_{k=1}^{n} x_k^2 \sigma_k^2 \right) + + \sum_{1}^{n} x_k \lambda_k \tag{45}$$

Relation (45) can be written as :

$$\overline{R}_M = R + \xi_M + \pm Var(R_M) + \lambda_M \tag{46}$$

with:

λ_M : the weighted-average shadow cost of incomplete information over all

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securities;

ι_M : the weighted average transaction cost over all securities.

Or we know that:

$$Cov(R_M; R_k) = \bar{}_k Var(R_M) \qquad (47)$$

From relation (47), we can write (44) as follow :

$$\overline{R}_k = R + \iota_k + \pm_k \bar{}_k Var(R_M) + {}_{,k} \qquad (48)$$

We replace the portfolio variance by its expression from relation (46) in (48) to obtain :

$$\overline{R}_k = R + \iota_k + {}_{,k} + \bar{}_k(\overline{R}_M \ ¡ \ R \ ¡ \ {}_{,M} \ ¡ \ \iota_M) \qquad (49)$$

Relation (49) yields a capital asset pricing model with transaction costs and information costs. Our Model is consistent with Merton's (1987) and Black's (1974) asset pricing models. If the transaction cost on asset k is equal to zero than $\iota_k = 0$ and $\iota_m = 0$, the model reduces to Merton's (1987) model. When all investors have the same information about security k than ${}_{,k} = 0$ and ${}_{,m} = 0$, the model is reduced to Black's (1974) model . When there are no transaction costs and no information costs, the model yields the standard CAPM .

This ¯nding shows that in equilibrium the market portfolio will be not e±-cient in the presence of of information costs and transaction costs.

Relation (49) can be written as follows :

$$\overline{R}_k = R + {}^a{}_k + \bar{}_k(\overline{R}_M \ ¡ \ R) \qquad (50)$$

where:

$${}^a{}_k = \iota_k + {}_{,k} \ ¡ \ \bar{}_k(\iota_M + {}_{,M})$$

The market portfolio is e±cient if ${}^a{}_k = 0$ for all $k = 1; 2:::n$.

Relation (49) gives the expected rate of return of security k as a function of the risk free rate, the transaction costs, the shadow cost of incomplete information and the risk premium. In this model the transaction cost and the information cost have the same role in the asset pricing but they are derived di®erently. This result contradict the fact that the information cost

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is considered as a transaction costs.

Relation (49) shows the intimate relationship between the betas of assets, the e®ects of transaction costs and information costs in equilibrium. So observing portfolios is equivalent to implicitly observing these costs.

Solnik (1974), De santis and Gerard (1997), Hassan and Youssif (2000) show that the international diversi¯cation does better than the national one. Our model shows that the costs of investment are important in a domestic and in an international setting and investors are willing to diversify their portfolios if the gains exceed these costs.

Our model shows the e®ects of frictions in capital markets and explains the equity home bias.

This conclusion is consistent with the empirical work of Coval and Moskowitz (2000) in which they explain the home bias by the locality of investors and asymmetric information.

The next section tests our model to show how transaction cost and asymmetric information explain some anomalies in portfolio choice.

4 The Empirical Evidence of the Model

This section provides an empirical test for our model given by relation (49). Testing this relationship directly remains di±cult task due to the existence of two non observable variables, information costs and transaction costs.

4.1 THE DATA

For our empirical study, we select 76 French shares taken from the ¯rst market. We extract from the DATASTREAM database the information. Our sample covers a ten year period going from July, 1st 1991 to December, 1st 2000. This represents 2460 daily observations.

The results of the empirical tests are presented only for ten companies, but the tests are applied for the whole sample. The ten companies are: GALERIES LAFAYETTE, HAVAS ADVERTISING, LVMH, LAFARGE, GEOPHYSIQUE(CIE.GL.), GECINA, GUYENNE and GASCOGNE, IMERYS, INGENICO, KLEPIERRE.

The ¯rst ¯ve companies are well known while the ¯ve other companies are less known.

4.2 The Estimation Procedure

We construct a series of transaction costs on the basis of a methodology chosen for reasons that we explain later. As for the information costs, we couldn't construct a series for two reasons . The ¯rst is that there are no explicit method for such a work. The second reason is that, the few existing methods need some data that are not available in France. We have to note that the choice of a given method will obviously a®ect the ¯nal result,(i.e, the estimate of the parameters). The choice of one method or another for the estimation of the transaction costs a®ects the statistical signi¯cance of the transaction cost and also of the information cost parameter (considered as constant during each year). The statistical signi¯cance of our results depends on the method of construction of the transaction cost series.

4.2.1 The Estimation of Transaction Cost

We use a method proposed by Kyle (1985) in order to obtain a sample of transaction costs related to the assets to test the model. We use the volume of all securities in our sample and their prices.
Each estimate of transaction costs is calculated for a one month (21 days) period using the following formula:

$$j \, LnP_{kt} \, ¡ \, LnP_{kt¡1} \, j = ® + ¿_{kt}Ln(1 + V_{kt}) \qquad (51)$$

where:
P_{kt} : the price of asset k at time t;
$¿_{kt}$: the transaction cost of asset k at time t;
V_{kt} : the volume of asset k at time t;
® : the intercept.
The method implemented to extract a sample of monthly transaction costs is consistent with Falkenstein (1996). He uses the volume as a proxy of transaction costs in order to show the e®ect of this friction on preferences for stocks as revealed by the fund portfolio holdings.
In the same way, our method was recently used by Lesmond and al (1999) to study the relation between the frequency of zero returns and transaction costs. We have ¯rst employed the measure of Roll (1984), $2^{p}\overline{¡cov}$, which is a measure of the e®ective bid ask spread as a proxy for the transaction costs. The method proposed by Roll (1984) is estimated using the ¯rst-order

autocovariance of security returns, but we get some positive autocovariance with our data. We find a problem similar to that in Harris (1990). Harris (1990) overcomes this problem by converting the positive autocovariance to negative. Therefore we employ the model of Kyle (1985).

4.2.2 The Estimation of Information Costs

Jensen (1968) tests the CAPM and the market efficiency. He adds an intercept to the capital asset pricing model to explain the part which is not explained by the market and attributed to the imperfection. In our test the information cost is approximated by the intercept of Jensen (1968).

The asymmetric information hypothesis and especially the shadow cost was tested by Kadlec and McConnel (1994) and recently by Foster and Karolyi (1999).

To test this shadow cost and how it explains the abnormal returns, the authors use the change in the number of the registered shareholders from pre-to post listing periods as a proxy for λ_k [1]. For practical reasons, we couldn't apply this method because these data are not available in France. This is why, we considered arbitrarily that information costs are constant every year and we implement the method employed by Jensen (1968). This is not a strong assumption if we estimate an average cost per year. We recall that the statistical significance of this information cost depends on the construction of

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[1]The method used by Kadalec and McConnel (1994) and Foster and Karolyi (1999) to show the relationship between the abnormal returns and the shadow costs of incomplete information is:

$$\Delta R_k = \beta_0 + \beta_1 \Delta \lambda_k + e_k$$

where the effect of the information cost is given by:

$$\Delta_{\lambda k} = \frac{Res_k \pounds Mktval_k}{NYSEhld_k} - \frac{Res_k \pounds Mktval_k}{OTChld_k}$$

with:

Res_k: the residual variance of security k;

$Mktval_k$: the market value of security k;

$NYSEhld_k$: the number of NYSE shareholders for security k;

$OTChld_k$: the number of OTC shareholders of the security k;

β_0, β_1 : are the intercept and the coefficient of this regression.

the transaction cost series. Nevertheless, the ideal situation is of course to construct a monthly proxy for information costs in addition to the monthly series of transaction costs. We will carry out this applying our model to the American market in a future work. Table 1 displays the results for a ten year estimation of our model. We consider only ten companies. All the $\bar{}_k$ are obviously statistically signi¯cant since the market portfolio explains an important part of the expected return of each company. All the transaction costs are also signi¯cant, which means that for the period considered, they a®ect the expected return. Information costs, they are signi¯cant only for ¯ve out of ten companies. We also note that they are almost all negatively correlated with the expected return, which is consistent with the results in Forester and Karolyi (1999) and Kadlec and MCconnell (1994).

If we observe that for relevant companies as GALERIE LAFAYETTE or LVMH and LAFARGE, the information cost is not signi¯cant because they are considered as "large ¯rms" and thus, the investors have an easy access to the information. We observed also that HAVAS ADVERTISING has a signi¯cant information cost, which is surprising because it is a "large ¯rm". Due to the fact that information costs are not signi¯cant for "large companies", in general, the investor tend to purchase these ¯rm's assets, which are better known. Our ¯nding is consistent with the results in Kang and Stulz (1997) and recently Dahliquist and Robertsson (2001).

Table 2 to Table 10, estimate parameters for each year during ten years and for the ten companies. In general, all the $\bar{}_k$ are statistically signi¯cant. Transaction costs are generally not signi¯cant. This can be the fact of the method retained to build up our transaction cost series. Di®erent methods imply di®erent results.
Our method is inspired by the Kyle's model for transaction costs and it doesn't display the results that we could have expected.
It is the same for the information cost parameter which is generally not signi¯cant for a one year frequence but, the estimates are always negatively correlated with the expected return. We observe for the year 1996 that many transaction costs are signi¯cant. This can be explained by the fact that the volume on the stock market for our ten companies has began to rise slowly in 1996 to be the highest in 1997 for all the decade. Besides, 1997 was the return of the economic growth in France. The increase of the activity in the Paris Bourse may have imply a more frequent rebalancing of portfolios, i.e.,

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more transaction costs.

5 Conclusion

This paper develops a capital asset pricing model in the case of asymmetric information and transaction costs.

It is shown that these two sources of market frictions have the same function in the model but they are derived di®erently.

This evidence contradicts some authors who view the information costs as transaction costs. The empirical work provides an explanation of the evolution of these variables.

Our tests show that the information costs are negatively correlated with the expected return and have an asymmetric evolution with transaction costs.

We show that the large ¯rms are better known by investors, which explain the bias in favor of some assets .

Our model can be used to account for the cost of capital and to show how frictions impact the capital budgeting.

EMPIRICAL RESULTS FOR TEN YEARS

Table 1

10 French Stocks	₅	¿k	‾k	adjusted R²	DW
GALERIES LAFAYETTE	¡ 0:049730 (¡ 1:328107)	0:259789¤¤¤ (4:152402)	0:404178¤¤¤ (9:34129)	0:05540	2:10181
GECINA	¡ 0:031515 (¡ 1:594517)	0:066705¤ (1:9283)	0:106995¤¤¤ (4:162084)	0:01060	2:4691
GEOPHYSIQUE (CIE.GL.)	¡ 0:203811¤¤¤ (¡ 3:6936)	0:31867¤¤¤ (5:46032)	0:542849¤¤¤ (7:95514)	0:08538	1:84353
GUYENNE GASCOGNE	¡ 0:093205¤¤¤ (3:5412)	0:295859¤¤¤ (5:2299)	5:229971¤¤¤ (9:67065)	0:07955	2:10594
HAVAS ADVERTISING	¡ 0:09695¤¤¤ (¡ 2:61466)	0:339519¤¤¤ (0:33951)	0:67402¤¤¤ (0:148013)	0:14801	1:96715
IMERYS	¡ 0:061895¤ (¡ 1:7396)	0:15218¤¤ (2:47265)	0:50336¤¤¤ (11:8111)	0:09432	2:23268
INGENICO	¡ 0:123956¤¤ (¡ 2:445262)	0:313658¤¤¤ (3:644360)	3:644360¤¤¤ (9:32097)	0:09918	1:94313
KLEPIERRE	¡ 0:03159 (¡ 1:34771)	0:19420¤¤¤ (3:37239)	3:37239¤¤¤ (3:37239)	0:01653	2:23177
LVMH	0:008194 (0:291506)	0:15639¤¤¤ (3:256624)	0:96279¤¤¤ (30:12817)	0:40280	1:80588
LAFARGE	¡ 0:043708 (¡ 1:45330)	0:10356¤¤ (2:519234)	0:854505¤¤¤ (21:6644)	0:28883	1:99198

¤ / ¤¤ / ¤¤¤ Signi¯cantly di®erent from zero at the 10 / 5 /1 percent level.
Numbers in parentheses denote asymptotic t-statistics.

EMPIRICAL RESULTS PER YEAR

Table2

GALERIES LAFAYETTE	δ	$¿k$	^-k	adjusted R^2	DW
Year 1	¡ 0:217154 (¡ 0:976376)	¡ 0:00526 (¡ 0:01304)	0:244760¤¤ (2:07467)	0:00239	2:27924
Year 2	¡ 0:12197 (¡ 0:72243)	0:35784¤¤ (1:72946)	¡ 0:06497 (¡ 0:47800)	0:00129	2:0358
Year 3	¡ 0:085895 (¡ 0:83774)	0:18605 (0:96249)	0:2404¤¤ (2:01341)	0:01623	2:19486
Year 4	0:0644 (0:56246)	0:5305¤¤ (2:40910)	0:5020¤¤¤ (5:0462)	0:09984	2:14788
Year 5	¡ 0:25595¤¤ (¡ 2:3066)	0:34661 (1:36143)	0:32816¤¤¤ (2:79015)	0:03829	2:19477
Year 6	¡ 0:2177¤¤ (¡ 1:83941)	0:83527¤¤¤ (2:69332)	0:39294¤¤¤ (3:11939)	0:06223	1:80927
Year 7	¡ 0:2177¤¤ (¡ 1:839417)	0:83527¤¤¤ (2:69332)	0:39294¤¤¤ (3:11939)	0:06223	1:80927
Year 8	0:04807 (0:25784)	0:28483 (1:15633)	1:15633¤¤¤ (5:22286)	0:09301	2:08766
Year 9	¡ 0:04156 (¡ 0:2408)	0:25814 (1:23043)	0:60084¤¤¤ (4:67749)	0:08301	1:8082
Year 10	¡ 0:00157 (¡ 0:0085)	0:06727 (0:49064)	0:421240¤¤¤ (3:28256)	0:04117	2:31233

¤ / ¤¤ / ¤¤¤ Signi¯cantly di®erent from zero at the 10 / 5 /1 percent level.
Numbers in parentheses denote asymptotic t-statistics.

EMPIRICAL RESULTS PER YEAR

Table 3

GECINA	$_{s}$	$¿_k$	$^{-}_k$	adjusted R^2	DW
Year 1	¡ 0:20403 (¡ 1:0891)	0:00485 (0:06115)	¡ 0:05258 (¡ 0:05258)	0:0009	2:4441
Year 2	¡ 0:07107 (¡ 0:8489)	0:07383 (0:79804)	0:08854 (1:13576)	0:00514	2:6332
Year 3	0:016286 (0:16768)	0:15764 (0:53946)	0:14726$^{¤}$ (1:75148)	0:00651	2:63272
Year 4	¡ 0:13609 (¡ 1:4144)	¡ 0:04706 (¡ 0:27422)	0:22330$^{¤¤¤}$ (0:22330)	0:01854	2:3952
Year 5	¡ 0:09626 (¡ 0:09626)	0:00534 (0:02986)	0:16433 (1:56193)	0:00380	2:36445
Year 6	0:04055 (0:705970)	0:13988 (0:782624)	0:15034$^{¤¤}$ (1:96966)	0:0117	2:38100
Year 7	¡ 0:04730 (¡ 0:60835)	0:22212 (0:9343)	0:21561$^{¤¤¤}$ (3:49525)	0:07105	2:32289
Year 8	0:04693 (0:5910)	0:11586 (0:38970)	0:0654 (1:3058)	0:00052	2:42501
Year 9	0:00995 (0:13748)	0:13685 (0:59760)	0:00767 (0:15059)	0:00139	2:42668
Year 10	¡ 0:0905 (¡ 1:2264)	0:11436 (0:38227)	0:03503 (0:75831)	0:00259	2:71691

EMPIRICAL RESULTS PER YEAR

Table 4

GEOPHYSIQUE (CI E:GL:)	δ	$¿k$	^-k	AdjR^2	DW
Year 1	¡ 0:223549 (¡ 1:11101)	¡ 0:26204 (¡ 0:80226)	0:98510¤¤¤ (7:07652)	0:27929	1:7628
Year 2	¡ 0:2754¤¤ (¡ 2:0388)	0:40822¤¤¤ (2:96301)	0:38426¤¤¤ (4:3318)	0:08217	1:9731
Year 3	¡ 0:08699 (¡ 0:9089)	0:12411 (0:77393)	0:25589¤¤ (2:58683)	0:0202	1:92881
Year 4	¡ 0:29489¤¤ (¡ 2:36849)	0:37009¤¤ (2:28337)	0:28971¤¤ (2:5839)	0:04242	1:8502
Year 5	¡ 0:08826 (¡ 0:5409)	0:50855¤¤¤ (3:98269)	0:36806¤¤ (2:55816)	0:09040	1:89342
Year 6	¡ 0:18569 (¡ 1:2956)	0:402328¤¤¤ (3:08827)	0:46996¤¤¤ (2:75215)	0:07349	1:9851
Year 7	0:169392 (1:20786)	0:15852 (0:83528)	0:69763¤¤¤ (6:089119)	0:15321	1:60040
Year 8	¡ 0:562507¤¤ (¡ 2:40548)	0:25232 (1:53878)	0:89510¤¤¤ (4:88378)	0:15091	1:81712
Year 9	¡ 0:216603 (¡ 1:01738)	0:38474¤¤ (2:50059)	0:37826¤¤ (1:94096)	0:04346	1:70838
Year 10	¡ 0:19022 (¡ 0:6574)	0:26104 (1:145801)	0:38688¤¤ (2:57634)	0:03610	0:03610

¤ / ¤¤ / ¤¤¤ Signi¯cantly di®erent from zero at the 10 / 5 /1 percent level.
Numbers in parentheses denote asymptotic t-statistics.

EMPIRICAL RESULTS PER YEAR
Table 5

GUYENNE GASCOGNE	$\hat{\delta}$	$\hat{\phi}_k$	$\bar{\phi}_k$	adjusted R^2	DW
Year 1	0:13472 (0:80825)	0:10362 (0:1240)	0:83928 (6:53864)	0:3321	1:9168
Year 2	¡0:08389 (¡0:831517)	0:12638 (0:617173)	0:375708¤¤¤ (4:00140)	0:06808	2:2884
Year 3	¡0:117077 (¡0:98641)	0:42471 (1:51395)	0:329597¤¤¤ (3:38153)	0:05813	1:92142
Year 4	¡0:191980¤¤ (¡2:54872)	0:48505¤¤ (1:98962)	0:45841¤¤¤ (5:756154)	0:1780	2:0444
Year 5	¡0:184652¤¤ (¡2:06613)	0:52387¤¤ (1:91798)	0:30851¤¤¤ (4:086916)	0:07334	2:08457
Year 6	0:026028 (0:25052)	0:25590 (1:45805)	0:34554¤¤¤ (0:34554)	0:04856	1:96952
Year 7	¡0:098967 (¡1:04958)	0:24161 (1:518917)	0:40662¤¤¤ (4:16756)	0:12816	2:11080
Year 8	0:007335 (0:05650)	0:12870 (0:6484)	0:24229¤¤¤ (3:31086)	0:03822	2:19141
Year 9	¡0:13836 (¡1:21832)	0:36938¤¤ (1:9835)	0:29356¤¤¤ (3:54379)	0:04906	1:96952
Year 10	¡0:170915 (¡1:30735)	0:34468 (1:32488)	0:18737¤¤¤ (2:65168)	0:02119	2:2395

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EMPIRICAL RESULTS PER YEAR
Table 6

HAVAS ADVERTISING	δ	ι_k	$\bar{}_k$	adjusted R^2	DW
Year 1	− 0:303922** (− 2:234692)	0:581549 (1:370816)	0:811831*** (4:764609)	0:27946	2:6842
Year 2	− 0:217041** (− 2:083611)	0:695744** (2:287372)	0:474667*** (4:530308)	0:11946	2:2277
Year 3	− 0:129699 (− 0:950375)	0:492329 (1:49511)	1:49511*** (2:67175)	0:03172	1:92792
Year 4	− 0:084494 (0:77772)	0:53899** (1:85736)	0:35696*** (3:73392)	0:05640	2:34311
Year 5	− 0:18125 (− 1:363794)	0:54448 (1:253673)	0:222789** (1:94951)	0:01582	1:99233
Year 6	− 0:10339 (− 0:87636)	0:49591** (1:92913)	0:65654*** (5:04827)	0:10115	1:94655
Year 7	0:007466 (0:061975)	0:273267 (0:97212)	0:47660*** (4:83938)	0:12001	2:10757
Year 8	− 0:088384 (− 0:49388)	0:34163 (1:21926)	0:58305*** (6:48029)	0:14698	2:14477
Year 9	0:18312 (1:05411)	0:14635 (0:75062)	0:69431*** (5:7236)	0:10742	2:15696
Year 10	− 0:17024 (− 0:740794)	0:268876** (2:341249)	1:68041*** (9:963472)	0:34945	1:77079

EMPIRICAL RESULTS PER YEAR

Table 7

INGENICO	$_{\beta}$	$¿_k$	$^{-}_k$	adjusted R^2	DW
Year 1	¡ 0:130397	0:00445	1:10593¤¤¤	0:3284	2:09846
	(¡ 0:64656)	(0:01028)	(6:59621)		
Year 2	0:01129	0:29022	0:79932	0:21705	2:3072
	(0:08109)	(0:91828)	(7:82792)		
Year 3	0:09069	0:00118	0:46874	0:08380	2:1652
	(0:71404)	(0:00573)	(4:05517)		
Year 4	0:010541	¡ 0:13147	0:607522¤¤¤	0:11244	2:24207
	(0:09481)	(¡ 0:13147)	(6:17693)		
Year 5	¡ 0:01071	0:05793	0:35393	0:04500	2:07165
	(¡ 0:07797)	(0:19182)	(3:41122)		
Year 6	¡ 0:14193	0:615429¤¤	0:4020¤¤¤	3:40398	2:29593
	(¡ 1:25546)	(2:22318)	(3:40398)		
Year 7	¡ 0:085214	0:22863	1:08175¤¤¤	0:09715	2:37082
	(¡ 0:672743)	(1:08175)	(4:90585)		
Year 8	¡ 0:23745	0:22000	0:51950¤¤¤	2:32790	2:32790
	(¡ 1:52211)	(1:02621)	(5:53443)		
Year 9	0:104426	0:03127	0:41314¤¤¤	0:03534	2:08577
	(0:52322)	(0:14810)	(2:97443)		
Year 10	¡ 0:1410	0:08627	0:23322¤¤	0:01613	2:37974
	(¡ 0:98663)	(0:37211)	(2:5130)		

EMPIRICAL RESULTS PER YEAR
Table 8

IMERYS	$_{s}$	i_k	$\bar{}_k$	adjusted R^2	DW
Year 1	¡ 0:15720 (¡ 0:65674)	0:20896 (0:86541)	1:28233¤¤¤ (7:65929)	0:24039	2:09705
Year 2	¡ 0:15781 (¡ 0:861306)	0:64220¤¤ (2:14328)	2:14328¤¤¤ (3:069517)	0:06385	2:0245
Year 3	¡ 0:30707¤¤ (¡ 1:95030)	0:5522¤¤ (2:511522)	0:02188 (0:14217)	0:02496	2:13540
Year 4	¡ 0:23498¤¤ (¡ 1:69569)	0:41059¤¤ (2:55524)	0:08256 (0:08256)	0:08256	2:21764
Year 5	2:21764 (¡ 0:96197)	0:24519 (0:75556)	0:46910¤¤ (2:66458)	0:04028	2:30866
Year 6	¡ 0:079719 (¡ 0:41464)	0:40181¤¤ (2:166503)	0:74245¤¤¤ (3:7650)	0:06261	1:83824
Year 7	¡ 0:08416 (¡ 0:4958)	0:27605 (1:25392)	1:25392¤¤¤ (4:20231)	0:06228	1:8800
Year 8	0:00866 (0:049537)	0:25574¤¤ (1:77802)	0:50118¤¤¤ (4:22032)	0:11216	2:50235
Year 9	2:50235 (¡ 0:57739)	0:46957¤¤ (2:08541)	0:62933¤¤¤ (4:380379)	0:09692	1:85060
Year 10	0:36422 (¡ 1:3677)	0:30814¤¤ (2:18771)	1:73497¤¤¤ (7:87626)	0:27226	1:5152

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EMPIRICAL RESULTS PER YEAR

Table 9

KLEPIERRE	α	β_k	γ_k	adjusted R^2	DW
Year 1	− 0:121427 (− 0:121427)	0:29445 (1:316849)	0:21556¤¤ (2:47770)	2:47770	2:42266
Year 2	− 0:189892¤ (− 1:92423)	− 0:001358 (− 0:007511)	0:192056¤¤¤ (2:637877)	0:01843	2:1384
Year 3	0:040221 (0:44476)	0:44476 (1:64027)	0:17726¤ (1:90604)	0:01970	2:26365
Year 4	− 0:09275 (− 1:14197)	0:56829 (0:56829)	0:13878 (1:86920)	0:02878	2:01487
Year 5	− 0:07285 (− 0:88427)	0:10264 (0:43465)	0:01500 (0:01500)	0:00101	2:39543
Year 6	0:03586 (0:474806)	− 0:05850 (− 0:30742)	0:25396¤¤ (2:28150)	0:02269	2:20386
Year 7	0:030835 (0:392004)	0:483923 (1:48627)	1:48627 (0:563360)	0:00493	2:11846
Year 8	0:119527 (1:24323)	− 0:23137 (− 0:667320)	0:16748¤¤ (2:37435)	0:02585	2:28313
Year 9	0:03669 (0:35178)	0:23258 (1:37607)	0:07685 (0:63602)	0:00551	2:12985
Year 10	− 0:03139 (− 0:3054)	0:09943 (0:344586)	0:06588 (0:88605)	0:88605	2:55287

EMPIRICAL RESULTS PER YEAR

Table 10

LVMH	ₛ	¿k	̄k	adjusted R^2	DW
Year 1	0:073654 (1:18589)	0:043633 (0:20503)	0:97122¤¤¤ (20:4508)	0:72901	2:12802
Year 2	¡ 0:067420 (¡ 0:81121)	¡ 0:04179 (¡ 0:27987)	1:08155¤¤¤ (14:5918)	0:53522	1:9563
Year 3	¡ 0:06771 (¡ 1:13123)	0:32423¤¤¤ (2:9885)	0:96298¤¤¤ (15:8225)	0:48853	2:04490
Year 4	0:15096¤¤ (0:15096)	0:082774 (0:74181)	0:94694¤¤¤ (16:9750)	0:49633	1:90784
Year 5	0:03112 (0:51429)	0:51429 (0:90402)	0:66247¤¤¤ (10:4754)	0:37378	1:5711
Year 6	1:5711 (0:52422)	0:28698¤¤ (0:28698)	1:20775¤¤¤ (13:9669)	0:41260	1:8706
Year 7	¡ 0:18451¤¤ (¡ 1:920831)	0:21290 (1:28938)	1:15741¤¤¤ (17:04135)	0:56718	2:02875
Year 8	2:02875 (¡ 0:52734)	0:05277 (0:62846)	1:07444¤¤¤ (12:3446)	0:41686	1:75527
Year 9	1:75527¤¤ (2:12592)	0:3338¤¤ (1:69180)	0:76555¤¤¤ (6:87362)	0:19877	1:87407
Year 10	1:87407 (¡ 1:22000)	¡ 1:22¤¤ (1:81155)	0:78106¤¤¤ (7:71466)	0:26885	1:64205

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EMPIRICAL RESULTS PER YEAR
Table 11

LAFARGE	α	β_k	γ_k	adjusted R^2	DW
Year 1	¡0:088190 (¡0:80415)	0:16372 (0:59444)	0:59444¤¤¤ (10:4216)	0:5600	1:79116
Year 2	¡0:04057 (¡0:4697)	0:14246 (0:73400)	1:12748¤¤¤ (14:9433)	0:4850	1:8959
Year 3	0:05600 (0:59227)	0:059809 (0:488375)	0:96480¤¤¤ (10:9822)	0:34933	1:97694
Year 4	¡0:008484 (¡0:11800)	0:03970 (0:454761)	0:90938¤¤¤ (0:90938)	0:46260	0:46260
Year 5	0:46260 (0:05366)	0:10982 (0:753408)	1:00883¤¤¤ (15:766)	15:766	15:766
Year 6	¡0:09581 (¡1:21640)	¡0:00189 (¡0:00189)	1:14268¤¤¤ (13:71761)	0:37280	1:86405
Year 7	¡0:10158 (¡1:14841)	0:18829¤¤¤ (2:60502)	1:001040¤¤¤ (17:3118)	0:54842	1:99804
Year 8	80:03419 (0:25427)	¡0:03177 (¡0:26806)	0:78533¤¤¤ (10:17611)	0:25679	1:88985
Year 9	¡0:03991 (0:123480)	0:123480 (0:90818)	0:757879¤¤¤ (5:75783)	0:11782	2:23720
Year 10	¡0:23144 (¡1:56779)	0:269109 (1:21825)	0:30989¤¤¤ (2:703839)	0:04077	2:04709

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