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A signalling approach to the revaluation of assets: a theoretical and empirical analysis

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ABSTRACT

In many countries firms can choose whether to report a revaluation in the financial statements. Besides contracting costs, signalling can determine the decision to revalue assets. An analytical model is developed which allows us to indicate conditions in which it is more likely that successful firms will not revalue assets as a credible signal to potential investors of their success. These industry settings include a high variance in success and low equity-to-debt ratios. The empirical results, using Belgian data, confirm that besides the classical contracting effects, successful firms are less likely to revalue assets in those industries with a high variance in performance or with low equity-to-debt ratios. As firms move closer to technical default or violate covenants, and as they are larger, they are more likely to revalue assets. Further, the results support the choice to revalue, but not the amount of revaluation, as a signalling device.

KEY WORDS: revaluation, signalling, contracting

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1. INTRODUCTION

Accounting laws in many countries such as the UK, Australia and Belgium, allow for the revaluation of tangible fixed and financial assets in the annual accounts. Managers have the discretionary power whether or not to report a revaluation of assets. Taking into account the true and fair view of the financial statements, also the amount of revaluation disclosed in the financial statements is a choice variable. Previous accounting studies (Brown, Izan and Loh , 1992; Whittred and Chan, 1992; Peasnell, 1994) concentrate on contractual relationships to explain the decision to revalue assets or not. Highly leveraged firms, which are close to, and want to avoid, the default on their debt covenants are more likely to revalue assets. In these empirical studies firms, which revalue assets are found to be larger, have larger property holdings and low market-to-book values. The signalling motive for revaluing assets is still a less examined issue. Peasnell (1994) proposes the hypothesis that revaluation of assets is a positive signal because it results in a decrease in the return on equity. Only when firms have positive inside information and shares are undervalued, they will be prepared to carry the costs of a decrease in the return on equity. This hypothesis was not confirmed by the empirical evidence. Further studies which analysed the abnormal returns on the stock exchange after a revaluation of assets yielded mixed results (Easton, Eddey and Harris, 1993; Standish and Ung, 1982; Emanuel,1989).

This paper is the first to develop and test an analytical model studying the signalling function of the revaluation decision. The environment which is modelled is one where the financial position of a company determines the probability of raising funds for new investments, while at the same time affecting the probability of reorganisation. The revaluation of assets is found to be a negative signal. Poorly performing firms benefit more from revaluing assets. Since these firms have a smaller net worth, they have a larger probability of violating the legal requirements with respect to the net worth. As the net worth increases by revaluing the assets, badly performing firms face a larger decrease in expected reorganisation costs due to revaluation. However, in a world of incompletely informed investors, as the return on equity decreases, poorly performing firms who revalue, will have more difficulty attracting new funds. If investors believe that the revaluation of assets is a negative signal, then it is less likely that funds will be provided or they will be provided only at a higher cost. This results in a decrease in the expected cash flows of the project. Because successful firms realise larger cash flows, the increase in the expected cash flows from not revaluing is larger for these firms, while at the same

time the increase in expected reorganisation costs from not revaluing is lower. As a consequence, not revaluing assets can be a powerful mechanism used by the successful firms to signal their success, their higher cash flows. Industry characteristics most favourable for signalling are shown to be a high variance in performance and low equity-to-debt ratios.

These analytical insights are empirically tested using Belgian data. The results confirm the signalling hypothesis that in industries with a high variance in performance and lower equity-to-debt ratios, successful firms are more likely not to revalue assets. The impact of other traditionally considered contractual relationships on the decision to revalue assets is also ascertained. Firms are more likely to revalue assets as their financial position is weaker and if the firm size is larger.

The paper is organised as follows. In section 2 the institutional environment is described. In section 3 the signalling model is developed. Univariate and multivariate tests are presented in the empirical analysis of section 4. Section 5 closes with conclusions.

2. INSTITUTIONAL BACKGROUND

In Belgium the accounting law allows the revaluation of fixed tangible and financial assets. Firms may revalue assets when the economic value of the fixed tangible assets determined on the basis of their use by the firm is permanently larger than their book value. Since no precise rules are prescribed for the revaluation of assets, managers can exercise discretion whether or not to report an increase in the book value of the assets. The revaluation of fixed assets is even more discretionary than the revaluation of financial assets. If the firms, which are controlled, do not realise profits or distribute all profits, the book value of financial assets can not be increased.

The revaluation of assets results in increases of the fixed assets and the revaluation reserve, which is part of the owner's equity (Art. 34 Royal decree October 8 1976). If firms revalue fixed tangible assets, the revalued assets must be depreciated over their remaining life. Hence, the revaluation of fixed assets results in a decrease in accounting profits for the period. Nevertheless, depreciation of the revalued amounts is not allowed by the tax authorities (Art. 24, Fiscal Law, Art. 44, 1°). Consequently, taxes can never be the reason for revaluing assets. However, some legal requirements can be more easily met by revaluing assets (Company Law, Article 77bis, 103 and 104). Also,

dividends can be distributed earlier, since a firm can only distribute profits when the net worth, defined as [total assets -total liabilities - value of the intangible assets - value of the set up costs], is larger than the value of capital and the unavailable reserves (Art. 77 bis Company Law). If a firm revalues assets, this requirement is more easily met and profits can be more readily distributed. In addition, if the net worth, defined as [total assets -total liabilities], is smaller than half of the capital, the general board of the firm has to decide whether to develop a reorganisation plan or end the activities of the firm (Art 103 &104 Company Law). If the net worth is smaller than the minimum level of capital, every related part (auditor, debt holders, owners, banks ...) can demand bankruptcy.

The next section develops an analytical model to explain revaluation of assets as a signalling device, taking into account the institutional framework in which Belgian firms operate. Additionally, in Belgium most firms are not widely held, therefore revaluation of assets is studied in an environment without a stock market. This implies that only the book value of the shares is available.

3. THE MODEL

As in the typical signalling models of corporate investment (cf. e.g. Meyers & Majluf, 1984), the signalling party is a firm needing capital to finance a new project, which generates either high or low cash flows. The receiving party is a potential investor, uninformed on the expected success of the project. After receiving the signal, i.e. observing whether or not the firm revalues its assets, investors decide on whether or not to invest. The signalling function of asset revaluation is studied in an environment, where the current financial position and the expected success of the project determine the probability of raising funds for an investment [1]. As the current financial position improves, investors have more confidence in the firm, and the funds can be more easily raised while at the same time the probability of a reorganisation drops.

The probability of not raising the funds given a fixed equity/debt ratio equals:

$$p^{nf}(\check{s}_t) = \exp(-a(E/D + \check{s}_t)) \qquad (1)$$

where:

[1] Alternatively, instead of the probability of raising funds, the beliefs of the investors can be modelled to influence the price/interest rate paid for the investment funds, yielding similar conclusions.

$p^{nf}(\check{s}_t)$: the probability that the money can not be raised given investors believe that the firm realises $\check{s}_t$ as cash flows

$\check{s}_t$: the cash flows from the project as perceived by the investors. Two possible types t are considered: s_H (high cash flows) or s_L (low cash flows).

a: a constant parameter, reflecting the general economic situation;

E/D: the amount of equity before revaluation as a share of total debt.

The equity-to-debt ratio is similar for both types of firms and common knowledge. The higher E/D, the lower the probability of not raising funds. In a complete information environment the amount of revaluation does not influence the probability of raising the funds for the project. In an incomplete information environment it does because the revaluation decision determines the beliefs of the investors on the success of the firm $\check{s}_t$.

Firms face a probability that they have to lay off employees, rearrange activities, etc,. which typically involve reorganisation costs. The probability of a reorganisation is smaller when funds for the new project are obtained and when the financial position is better. The probability of a reorganisation can be expressed as:

$$p^{re/f}{}_t(s_t,R)=\exp(-b((E+R)/D+ s_t)) \qquad (2a)$$

where :

$p^{re/f}{}_t(s_t,R)$: the probability that a reorganisation is needed given that funds are acquired

s_t: cash flows from the project for firms of type t with t=H, L

R the amount of revaluation, which varies between 0 and M;

b: a constant term.

Given that cash flows are only realised when funds can be obtained, we also need to define the probability of reorganisation in case of no funds:

$$p^{re/nf}(R)=\exp-b((E+R)/D) \qquad (2b)$$

The amount of revaluation varies between 0 and M, where M is the maximum amount allowed by a true and fair view in the financial statements. The total expected reorganisation costs, TER, are not only determined by the probability of a reorganisation $p^{re/f}{}_t$ but also by the probability of acquiring the funds $(1- p^{nf})$ and by the level of reorganisation costs. Those costs are assumed to be non-firm specific, fixed and equal to

C. The total expected reorganisation costs (TER) for each type of firm depends on the investor's beliefs on the firm's type and the amount of revaluation:

$$TER_t(\check{s}_t, R) = ((1 - p^{nf}(\check{s}_t)) * p^{re/f}{}_t(s_t,R) + p^{nf}(\check{s}_t) * p^{re/nf}(R))*C. \quad (3)$$

The total expected reorganisation costs depends on the probability that funds are provided $(1 - p^{nf}(\check{s}_t))$ or not $(p^{nf}(\check{s}_t))$. In the first case the probability that a reorganisation is faced that costs C, is smaller $(p^{re/f}{}_t(s_t,R)C < p^{re/nf}(R)C)$.

Compared to other accounting methods, the revaluation decision need not be discrete (FIFO or LIFO, linear or accelerated depreciation) but can be continuous up to a maximum level M: firms not only have to decide whether or not to revalue the assets but also to determine the amount of revaluation. In a ***complete information environment*** as the amount of revaluation increases, the expected reorganisation costs decrease, and all firms have an incentive to revalue assets to minimize the total expected reorganisation costs TER. It is straightforward to show that the first order derivative of the total reorganisation costs with respect to R is negative. (∂ TER/∂ R=-b/D*TER <0) Therefore, all firms have an incentive to revalue assets by the maximum amount of M (See Figure 1). The classical contractual hypothesis in a complete information environment can likewise be identified: the lower is the equity-to-debt ratio of a firm, E/D, the steeper the decline in expected reorganisation costs due to R (given that ∂ TER/∂ E/D < 0).

$p^{re}(s_t, R)$

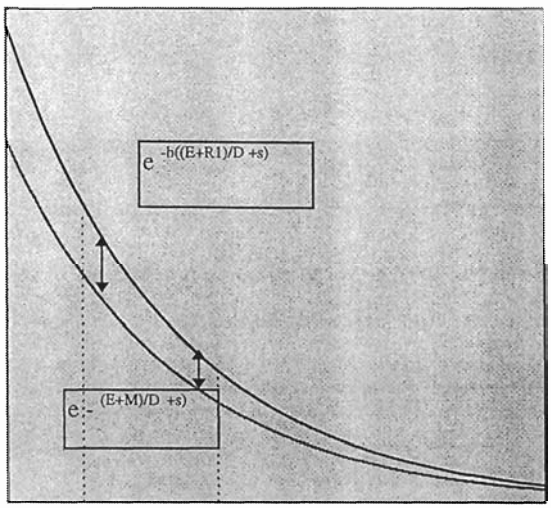

Figure 1 : the effect of a revaluation on the probability of a reorganisation

In an ***incomplete information environment***, the successful firms can only reveal their type by choosing a smaller amount of revaluation (R1 < M). If investors observe a smaller amount of revaluation in a separating equilibrium, they correctly update their beliefs that it is a successful firm, s_H. For the firm of type H, the probability of receiving funds increases. As a smaller amount of revaluation results in a larger probability of raising the funds, the expected cash flows increase by $s_H*(e^{-a(E/D+\check{s}_t)}-e^{-a(E/D+\check{s}_H)})$. As the cash flows realised are larger for the successful firm, those firms gain more by choosing a smaller amount of revaluation.

At the same time, the amount of revaluation influences the level of expected reorganisation costs. If a firm revalues the assets by a smaller amount, the probability of receiving funds increases, which decreases the level of reorganisation costs. However, the choice of a smaller amount of revaluation results in a weaker financial position, which increases the level of expected reorganisation costs. As proposition 1 in the appendix shows, the choice of a smaller amount of revaluation, R1 < M, results in a net increase in the expected reorganisation costs.

Since the probability of a reorganisation is a decreasing convex function of success, the choice of a smaller amount of revaluation (R1 < M) results in a larger increase in the probability of reorganising and hence in the expected reorganisation costs for the unsuccessful firm (see Figure 1). The proof is in proposition 2 of the appendix.

When the unsuccessful firm chooses a smaller amount of revaluation it faces a lower increase in expected cash flows and a larger increase in expected reorganisation costs as compared to a successful firm. A separating outcome where the successful firm chooses a smaller amount of revaluation than an unsuccessful firm can be a *sequential equilibrium*, where neither type of firm has an incentive to deviate and investor's beliefs are consistent. The unsuccessful firm will choose the value maximising amount of revaluation M, while the successful firm selects the amount of revaluation, which maximises its expected cash flows and still avoids imitation by the unsuccessful firm. Proposition 3 in the appendix derives the optimal amount of revaluation for the successful firm :

$$R^* = D/b^*(\ln TER_L(\check{s}_H, 0) - \ln((p^{nf}(\check{s}_L)-p^{nf}(\check{s}_H))^*s_L + TER_L(\check{s}_L, M))$$

Due to asymmetric information the successful firm can only reveal its type by choosing an amount of revaluation, R* sufficiently smaller than M, that the unsuccessful firms cannot imitate.

It is important to note that any revaluation amount smaller than R* can also result in a separating equilibrium. But in this case the successful firm is not maximising its expected profits. As shown in the appendix, a dichotomous choice, where a successful firm would choose to not revalue at all, while the unsuccessful firm would choose to revalue the maximum amount M, can be a sequential equilibrium, if the expected cash flows of the successful firm s_H are sufficiently large.

For the empirical analysis it is important to study which characteristics influence the probability of a reaching a separating equilibrium, as well as the optimal amount of revaluation chosen by the firms. One characteristic that determines the net benefits of signalling is the difference in expected cash flows between the good and the bad types. If the difference between the cash flows of the successful and the unsuccessful firm increases, both types of firms gain more from revaluing the assets by a smaller amount: not only does the increase in expected cash flows from signalling increase, but the increase in expected reorganisation costs decrease (see proposition 4 in the appendix). Therefore, in industries with large differences in performance the amount of revaluation chosen by the successful firms, R* must be smaller to avoid imitation by the unsuccessful firms. The proof of this can be found in proposition 4 in appendix. Further, it can be

shown that the increase in expected cash flows is larger for the successful firm, while the increase in expected reorganisation costs is lower than for unsuccessful firms. Hence, the probability of establishing a separating equilibrium increases with a larger variance in expected performance, an empirically testable hypothesis. The more distinct is the successful firm, the more incentive it will have to differentiate himself from other less successful firms in the industry, which he can do by revaluing less.

The initial equity-to-debt ratio, which the model assumes to be type-independent, likewise influences the costs and benefits of revaluing less as signalling device. As the initial equity-to-debt ratio is higher, the increase in the expected cash flows from signalling becomes less important. Hence, revaluing less to signal success becomes less attractive. But at the same time, a higher equity-to-debt ratio leaves a smaller increase in expected reorganisation costs due to signalling, making signalling less costly. As the signalling cost and the signalling revenue have confounding effects, no precise outcome can be given. Also the effect on R* is ambiguous (see proposition 5 in the appendix). However, for the successful firm the signalling revenue reduction effect is larger and the cost-dampening effect is smaller than for the unsuccessful firm. This means that for fewer combinations of s_H and s_L a separating equilibrium can be reached. Consequently, in industries with higher equity-to-debt ratios, revaluing less as a signalling device used by the successful firm becomes less likely.

4. EMPIRICAL ANALYSIS

A sample of Belgian industrial companies is selected to test a number of hypotheses originating from the theoretical model. The analysis focuses on three industries : chemicals, metals and construction. [2] For those industries, firms which reported their assets in 1989 are included in the sample, resulting in a total number of 224 companies: 65 in the chemical industry, 96 in the metal industry and 63 in the building industry. The total number of revaluations equals 45, which is 2% of the population, a relatively low percentage. The non-revaluers are randomly chosen from the industry

[2] The industries included are : the production and preliminary processing of metals (nace 22), the extraction of minerals other than metalleferious and energy-producing minerals, peat extraction (nace 23), manufacture of non-metallic mineral products (nace 24), chemical industry (nace 25), the manufacture of pharmaceutical products, manufacture of soap, synthetic detergents, perfume and toilet preparation (nace 257 and nace 258), manufacutre of metal articles (nace 31), mechanical engineering (nace 32), manufacture of office machinery and data processing machinery (nace 33), electrical engineering (nace 34), manufacture of motor vehicles and motor vehicles parts (nace 35), manufacture of other means of transport (nace 36), instrument engineering (nace 37) and building industry (nace 50).

while respecting the relative occurrence of the industry in the economy[3]. Only consistent non-revaluers are retained: firms, which did not revalue in 1989, but did so previously in 1988 are not included in the class of non-revaluers. The data source consists of the annual accounts published.

Besides signalling motives for (not) revaluing, the influence of contracting costs are included in the empirical analysis. First the hypotheses and variables are presented, after which the results are reported.

4.1 Hypotheses

The theoretical model presented above, generates a number of signalling hypotheses that can be tested empirically. A critical variable determining the use of revaluation as a signalling device is the expected success of the firm. A first problem is how to measure (expected) success. Since most of the firms are not listed on the stock exchange, the market-to-book value can not be used as a measure of success. Because the market to book value is determined by the cash flows realised, the ratio of cash flows [4] over fixed assets is chosen to proxy success, where the fixed assets are measured before revaluation.[5] Given that the cash flow series show a high correlation over time, current cash flows can proxy for expected success.

As the theoretical section detailed, the characteristics of the industry have a significant impact on the incentives to signal success. A separating equilibrium is more likely to be reached in industries with a high variance in performance. This results in the following hypothesis:

H1: In industries with a high variance in performance successful firms are less likely to revalue assets than unsuccessful firms.

Similarly, the equity-to-debt ratio influences the incentive to use revaluation as a signalling device. Although it is theoretically unclear whether firms are more or less likely to revalue in industries with high equity-to-debt ratios, the model predicts that in industries where the equity-to-debt ratio is larger, successful firms are less likely to signal their success by revaluing less.

H2: In industries with low equity-to-debt ratios, successful firms are less likely to revalue assets than unsuccessful firms.

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[3] This sample selection was necessary to reduce the set of firms from 9000 to a more manageable number.
[4] If the term 'cash flows' is used in the text, these are the cash flows from operations.
[5] This ratio is preferred over cash flows to equity, since equity is distorted by past performance and dividend policy.

Besides these signalling hypotheses the influence of the traditional motives for revaluation, such as legal requirements and other contractual relationships is also examined (Watts & Zimmerman, 1990). This allows us to test, whether after allowing for these classical factors, signalling has incremental value in explaining the choice to revalue assets.

The legal requirement that the net worth must be larger than half of the amount of capital provided by the owners can be an incentive to revalue assets. Introducing the impact of legal covenants, firms are more likely to revalue assets if they violate the covenant. For firms close to the legal covenant, as their net worth decreases, the probability of a reorganisation increases. This results in the following hypothesis:

H3:If a firm violates the legal requirement or is close to violation, the probability of a revaluation increases as the net worth of these firms becomes smaller.

For firms which have a large net worth and where the probability of violation is small, H3 is irrelevant. Hence, for firms not close to violation, changes in the net worth should not influence their decision to revalue.

Empirical studies do not agree on the effectiveness of a covenant itself rather than a proxy (Brown et al., 1992; Peasnell, 1994; Beneish and Press, 1995). Because net worth is determined by the level of retained earnings and the undistributed profits [6], the ratio (retained earnings + undistributed profits)/total assets can serve as a proxy for measuring the closeness to the legal covenant. This results in the following hypothesis:

H4: As the (retained earnings + undistributed profits)/Total assets increases, firms are less likely to revalue assets.

The introduction of the legal covenant variables simultaneously includes the influence of debt contracts on the revaluation decision. For firms with large reserves and retained earnings, the possibility of violating debt covenants is smaller [7].

Not only the amount of debt but also the composition of debt in the firm could influence the decision to revalue assets. An interesting hypothesis is whether the non-revaluation is more effective with banks than other debt holders.

H5: As the share of the debt owed to banks increases, firms are more/less likely to revalue their assets

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[6] Undistributed profits are the profits realized in the current period but not distributed, while retained earnings are the undistributed profits of the previous periods.

[7] The debt/equity ratio can not be added directly because of the high correlation with other independent variables.

Firms with larger investments in fixed and financial assets have more opportunities to revalue. As in other studies (Brown et al;, 1992; Peasnell, 1994), the ratio (fixed tangible + financial assets)/total assets is introduced to control for this effect.

H6: As the investment in financial and fixed assets increases, firms are more likely to revalue assets

To measure the political visibility of firms two alternatives are available: sales and the seller concentration in the industry as proxied by the Herfindahl index. Other variables are less suitable in this environment. As the revaluation of assets does not affect taxes, the tax rate can not be used as an explanatory variable. The idea is that larger firms or firms in more concentrated industries have a larger incentive to revalue, which decreases reported income and hence diminishes political visibility. Size is also used in other studies (Peasnell, 1994;Brown et al. 1992) where it is proxying other influences such as experience with opportunities offered for creative accounting by the accounting law. Therefore, both size and the Herfindahl index are introduced in the model. This results in the following hypotheses:

H7: Larger firms are more likely to revalue assets

H8: Firms in highly concentrated industries are more likely to revalue assets

The following table summarizes the explanatory variables and their expected signs. Two dependent variables are used: the discrete choice to revalue and the continuous choice of the magnitude of revaluation. For the discrete choice, a dichotomous (0,1) variable is created that takes the value of 1 if the firm revalues, and 0 otherwise. For the continuous choice, the amount of revaluation as a % of total assets before revaluation is used.

Table 1: Description of the variables and the hypotheses

Variable	C=company level I=industry level	Description	Hypothesis	Expected sign
CF/FA	C	Cash flows/ (fixed assets before revaluation)		
DV_H	I	A dummy if the variance in performance in the industry is high; otherwise 0 [8];		
DV_L	I	A dummy if the variance in performance in the industry is low; otherwise 0;		
$CFDV_H$	C	$CF/FA*DV_H$: The CF/FA in industries with a high variance in performance	H1	-
$CFDV_L$	C	$CF/FA*DV_L$: The CF/FA in industries with a low variance in performance	H1	0
DD_H	I	A dummy if the equity-to-debt ratio in the industry is high, otherwise zero [9]		
DD_L	I	A dummy if the equity-to-debt ratio in the industry is low, otherwise zero		
$CFDD_H$	C	$CF/FA*DD_H$: The CF/FA in industries with a high equity-to-debt ratio	H2	0
$CFDD_L$	C	$CF/FA*DD_L$: The CF/FA in industries with a low equity-to-debt ratio	H2	-
RES/TA	C	(Reserves + retained earnings)/total assets before revaluation;	H4	-
DLAWA	C	The closeness to the covenant expressed as (the net worth /the amount of capital -1) for firms, which have a net worth larger than the amount of capital [10];[11];	H3	0
DLAWB	C	The closeness to the covenant expressed as (the net worth/the amount of capital -1) for firms, which have a net worth smaller than the amount of capital;	H3	-
S	C	Sales realized in the period;	H7	+
HF	I	The Herfindahl index on a two digit industry level	H8	+
FFA/TA	C	(Tangible fixed + financial assets before revaluation)/ total assets before revaluation;	H6	+
DOB	C	Debt owed to banks/ total debt;	H5	?

4.2 Results

Before presenting the regression results, a few univariate tests are presented.

3.3.1 Univariate tests

[8] The variance in performance is determined on a 2 digit industry level. Several critical values were tried. The best results were generated with high defined to be larger than 350. The variance in performance is high for sector 31, 32, 34, 35, 36 and 50.

[9] The equity-to-debt ratio is low if it is smaller than 0.32. This situation occurs for sector 25,33,37 and 50.

[10] The legal covenant demands that the net worth is larger than half of the capital. A higher level of capital is chosen for the determination of the dummy to include the firms close to covenant default.

[11] The closeness to the covenant is expressed as a quotient to eliminate the influence of size.

As these financial ratios are not normally distributed, the non-parametric Terry Hoeffding test is used to identify any possible difference in financial ratios between companies that choose to revalue and those companies not revaluing. [12] The results of this univariate test are shown in table 2.

Table 2:

The results from the univariate Terry Hoeffding test

	Deviation from Mean score non-revaluers n=179	**Deviation from Mean score revaluers n=45**	**p-value**
$CFDV_H$	0.079	-0.31	0.0152
$CFDV_L$	0.029	-0.12	0.3048
$CFDD_H$	0.024	-0.093	0.4643
$CFDD_L$	0.091	-0.362	0.0019
DLAWA	0.135	-0.533	0.0001
DLAWB	0.130	-0.514	0.0001
RES/TA	0.158	-0.628	0.0001
FFA/TA	-0.014	0.056	0.6647
DOB	0.005	-0.021	0.8678
S	-0.018	0.071	0.5864

The univariate tests suggest that the industry characteristics influence the possibility to signal success by non-revaluation of assets. In industries with a high variance in performance, non-revaluers perform significantly better than the revaluers while in industries with a low variance in performance, no significant variance in performance between the two types can be found. Likewise, the importance of the equity-to-debt ratio is illustrated. In industries with a low equity-to-debt ratio, the non-revaluers perform significantly better than the revaluers. This difference doesn't show up in industries with a high equity-to-debt ratio.

[12] The Terry Hoeffding test is preferred above other non-parametric tests because it asymptotically has the same power as a t-test for normally distributed variables. The chance that the null hypothesis is rejected if it may not be rejected is smaller than when other non-parametric tests are used.

Similarly along the closeness to the legal covenant dimension, both types of companies perform differently. Non-revaluers have a higher net worth, expressed as a share of their capital, as compared to revaluers. This holds irrespective of whether firms are close to the legal covenant or not. The influence of covenants is also confirmed by the significance of the variable RES/TA. Retained earnings are higher for the non-revaluing firms.

Finally, none of the share of debt owed to banks, the relative importance of fixed and financial assets, nor the size of the firm is significantly different between the revaluers and the non-revaluers.

Interestingly, a significant difference was found in the increase in cash flows [13] after the revaluation decision between the revaluers and non-revaluers. Those firms that choose not to revalue in 1989, experience a significantly higher increase in cash flows from 1989 to 1990, as compared to firms that did choose to revalue: The deviation from the mean score for non-revaluers is 0.11, while for the non-revaluers this is -0.531, a difference that is highly significant (p=.0003). These results could be interpreted as showing consistency in the use of non-revaluation of assets as a positive signal of expected success, or that signalling helps to improve the expected rate of success: firms abstaining from revaluation not only perform better in this period but also in the next period. However, without controlling for other determining factors, these results might simply reflect a time trend in successfullness.[14]

3.3.2 Multivariate tests

In the multivariate analysis the joint power of the independent variables in explaining the revaluation decision is tested. First, the discrete choice problem is studied. As the dependent variable is a discrete (1,0)-variable and the dependent variables are not normally distributed, a logistic regression is used. The results are shown in table 3. Also included in this table are the OLS results for the the amount of revaluation, which is a continuous dependent variable. (Model 11)

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[13] The increase in cash flows is defined as
DCASH= (cash flows 90-cash flow 89)/cash flows 89.

[14] Ideally, the variable DCASH , which express the incremental increase in cashflows, should be treated as dependent variable. This however requires an indepth study of performance determinants, among which signalling is but one. This clearly moves beyond the scope of the study reported here. DCASH as independent variable in the decision to revaluate or not is avoided because of obvious simultaneity problems. The increase in cash flows can be the result from identification as a successful firm in this period.

Model (1) includes the basic signalling and contracting motives for revaluation. The results indicate that successful firms are not always found to signal their success by not revaluing their assets. In industries with a high variance in performance, it is more rewarding for successful firms to reveal their true type by signalling. The coefficient of $CFDV_H$ is negative and significant, while the coefficient of $CFDV_L$ is not. Hence, signalling by successful firms through not-revaluing the assets is only found in industries with a high variance in performance, consistent with H1. That signalling motives can explain firm's decisions to revalue or not, is not only shown by the significance of the coefficients, at least for $CFDV_H$, but also by the higher R^2 as compared to model (4), where these variables are lacking.: [15]

Law also has an important influence on the decision to revalue assets. Firms, which are close to the covenant default or violate the covenant are more likely to revalue assets as their net worth shrinks. This is shown by the significantly negative coefficient of DLAWB in model (1), consistent with H3. The smaller and less significant coefficient of DLAWA confirms that changes in the net worth are less relevant for firms, which are not close to covenant default. Finally, the variable sales has a significant positive coefficient, consistent with H7 that large firms are more likely to revalue. The insignificance of the Herfindahl index might reflect that size is rather measuring other important factors besides political visibility, such as a knowledge about the opportunities offered by the accounting law.

As the univariate tests already revealed, the decision to revalue assets is not influenced by the relative importance of fixed and financial assets, nor by the relative amount of debt owed to banks. Dropping these variables from the model doesn't change the reported results[16]. That all the variables in model (1) are relevant in explaining the revaluation decision is, besides the reported R^2 is also illustrated by the apparent error rate. If each observation is classified using the model, only 17.85 % of the observations is misclassified [17].

To confirm the results from H1, a split regression is reported for the industries with a high variance in performance (model 2, DV_H=1, n=149) and for the industries with

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[15] The R^2 for these logistic models are calculated through (-2log(intercept only)-2log(intercept & covariates))/-2log(intercept only) (see Cramer (1991)).

[16] Multicollinearity is not an important problem for the results, as the correlation matrix, see Appendix, demonstrates. The largest correlation exists between DOB and FFA/TA and equals -0.39155.

[17] Large differences exist between the results for each sector. The model gives the best results for the construction industry (15.87 %) and the worst results for the metal industry (19.79 %). The error rate for the chemical industry equals 16.92 %.

a low variance in performance (model 3, DV_L=1, n=75). As expected, the variable CF/FA is only significant when the variance in performance in the industry is high. This confirms again that the performance of the other firms in the industry determines the decision by successful firms to signal their success through not revaluing assets. Furthermore, if signalling by the non-revaluation of assets does not occur, in casu in those industries with a low variance in performance, other contractual relationships become more relevant. As the fixed and financial assets are more important in the financial statements, a revaluation is more likely to occur. Also larger firms are more likely to revalue assets.

To further zero in on the contracting hypotheses, the legal covenant itself, (the net worth -half of the capital), is introduced in model 6 instead of a higher covenant, (the net worth - the amount of capital). Since both variables, DLAWA' and DLAWB', have the opposite results in terms of significance as compared to model 1, the results seem to suggest that firms which are close to, but not yet facing, the legal covenant default are most likely to revalue their assets when their net worth decreases. Those firms have a net worth between half and the full amount of capital.

In model 5 the covenant itself is replaced by the proxy for the self financing capacity of the firm. This model has a somewhat higher % of misclassified observations than the basic model (18.75% > 17.85%), which suggests that the covenant itself is a better measure than the proxy. All the other variables which are significant in model 1, remain significant, indicating a degree of robustness of these results.

To further check the robustness of the results, the firms, which revalued their assets in the previous year but not in the current year are added to the group of the revaluers in model 9 instead of being deleted from the sample in model 1 (n=18). All the basic results remain, although the variable sales no longer is significant. The Herfindahl index is deleted in model 7. Comparing the performance of this model with the basic model (1) shows that political visibility to escape regulation is certainly not a main issue

Table 3: The results from the multivariate tests

	model 1	model 2	model 3	model 4	model 5	model 6	model 7	model 8	model 9	model 10	model 11
intercept	-0.9434	-01910	-3.2065	-1.3085	-0.7954	-0.7904	-1.0591	-0.8184	-1.0612	-1.8834	-0.00090
	(0.0177)	*(0.1528)*	*(0.0218)*	*(0.0002)*	*(0.0372)*	*(0.0447)*	*(0.0046)*	*(0.0476)*	*(0.0071)*	*(0.0029)*	*(0.9311)*
CF		-1.1334	-0.004								
		(0.0211)	*(0.9941)*								
CFDVH	-0.6977	-	-		-0.7905	-0.8126	-0.6816		-0.7274	-0.7063	-0.002042
	(0.0905)	-	-		*(0.0487)*	*(0.0465)*	*(0.0930)*		*(0.0771)*	*(0.0940)*	*(0.7142)*
CFDVL	-0.2159	-	-		-0.2708	-0.2123	-0.2304		-0.1852	-0.2306	0.008401
	(0.4399)	-	-		*(0.3255)*	*(0.4484)*	*(0.4070)*		*(0.4967)*	*(0.4495)*	*(0.2814)*
S	1.21E-7	-5.26E-8	1.88E-7	1.27E-7	1.22E-7	1.15E-7	+1.04E-7	1.32E-7	1.16E-8	1.22E-7	-1.23E-9
	(0.0309)	*(0.8017)*	*(0.0199)*	*(0.0237)*	*(0.0247)*	*(0.0381)*	*(0.0445)*	*(0.0203)*	*(0.5842)*	*(0.0404)*	*(0.4497)*
FFA/TA	0.4343	-2.2318	5.6976	0.8415	0.3422	0.5248	0.2254	0.4594	0.3152	0.2906	0.063807
	(0.6768)	*(0.1483)*	*(0.0125)*	*(0.4060)*	*(0 .7402)*	*(0.6143)*	*(0.8234)*	*(0.6600)*	*(0.7584)*	*(0.7835)*	*(0.0263)*
DOB	-1.7629	-0.6393	-3.7710	-1.7768	-2.0108	-1.7002	-1.7708	-1.8550	-1.8480	-1.8444	-0.066523
	(0.1395)	*(0.6924)*	*(0.0867)*	*(0.1335)*	*(0.0905)*	*(0.1491)*	*(0.1388)*	*(0.1211)*	*(0.1102)*	*(0.7835)*	*(0.0198)*
DLAWA	-0.0820	-0.1242	-0.0616	-0.0866			-0.0831	-0.0895	-0.0781	-0.0852	-0.000082
	(0.1022)	*(0.1331)*	*(0.4543)*	*(0.0922)*			*(0.1028)*	*(0.0823)*	*(0.1200)*	*(0.1030)*	*(0.6999)*
DLAWB	-0.9054	-0.2279	-3.7780	-1.2477			-0.8956	-0.9695	-0.7850	-1.0417	-0.038370
	(0.0533)	*(0.6979)*	*(0.1727)*	*(0.0063)*			*(0.0572)*	*(0.0319)*	*(0.0674)*	*(0.0239)*	*(0.0001)*
RES/TA					-2.2389						
					(0.0040)						
DLAWA'						-0.0498					
						(0.0720)					
DLAWB'						-0.4525					
						(0.1247)					
TECH										-1.0678	
										(0.0404)	
CFDDH								-0.1564			
								(0.5191)			
CFDDL								*-1.3066 (0.0272)*			
HF	*-2.0173 (0.4110)*	*1.9086 (0.5586)*	*-3.4678 (0.5534)*	*-2.0247 (0.4059)*	*-1.9210 (0.4206)*	*-2.0322 (0.4023)*		*-3.0410 (0.2371)*	*0.0285 (0.9898)*	*-0.8068 (0.7393)*	*0.048183 (0.4436)*
R^2	16.12 %	15.67%	38.79%	14.22 %	14.55 %	15.44%	15.80%	17.61%	13.38 %	18.13 %	17.80%
-2log intercept	223.832	148.767	75.611	223.832	223.832	223.832	223.832	223.832	231.637	223.637	
-2log intercept and covariates	187.361	125.499	45.665	191.994	191.268	188.888	188.050	184.037	200.639	182.847	
n	224	149	75	224	224	224	224	224	240	224	224
misclassifica-tion rate	17.85 %	17.44 %	13.33 %	18.30 %	18.75 %	17.86 %	18.75%	17.41 %	16.04 %	18.30%	

in revaluing assets. [18]

Another result from the theoretical model is that a separating equilibrium is more likely to be reached in industries with a low equity-to-debt level. This problem is studied in model 8. [19] As in the basic model, the influence of success on the decision to revalue assets is analyzed for industries with a low as compared to a high equity-to-debt level. As the variable CFDDH does not have a coefficient significantly different from zero, successful firms are not more likely to reveal their type in industries with a high equity-to-debt ratio. This contrasts with industries where the equity-to-debt ratio is low. In those circumstances, successful firms have a vested interest in not revaluing their assets to reveal true types, as the significantly negative coefficient of CFDDL shows, consistent with H2.

Bar-Yosef et al. (1995, p60-61) put forward the idea that signalling is more likely to occur in industries with high levels of R&D expenditures. As more uncertainty exists about the success of those R&D activities, signalling is more important in those industries. To test this in the context of revaluation, a dummy TECH is added to model 10, which equals 1 for industries with high R& D-to-sales ratios[20]. As the variable TECH has a significantly negative coefficient, a revaluation of assets is less likely to occur in high-tech industries. All this confirms that firms have more incentives to reveal their type in high tech industries where asymmetry in information on company success is more predominant. Including the interaction with successfullness fails to establish a significant effect, indicating that all firms, not just the more successfull firms have a higher incentive to not revalue in these industries. [21]

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[18] Some other variables were added to model 1, but not reported. To measure the concern of the firm about changes in its financial structure, DEBTVAR, the amount of debt increase in the last year, is added to model 1. As the increase in debt did not show up with a significant coefficient (p=0.8291), the change in financial structure does not seem to influence the decision to revalue assets. Finally, a dummy equaling 1 if the number of employees is larger than 50, i.e. companies which by law have to organize employee councils, is introduced. When a firm has to report its results to an employee council, it might have an extra incentive to revalue fixed assets. If assets are revalued, they can be depreciated, which decreases reported income, which in turn can soften wage demands by the employees. However, also this dummy failed to have a significant coefficient (p=0.3264).

[19] Including both industry characteristics, variance in performance and equity-to-debt ratio, was not possible, given that CFDDL turned out to be a linear combination of CFDDH, CFDVH and CFDVL. Hence, both characteristics had to be tested separately.

[20] The industries with high R&D expenditures are 25, 257 and 258, 33 and 34.

[21] It should be added that the significantly negative coefficient of this variable is mainly due to the sectors 257(pharmaceuticals) and 258(cosmetics).

Finally, rather than the decision on whether or not to revalue assets, the actual amount of revaluation (as a % of total assets before revaluation) is taken to be the dependent variable in model 11. The OLS results show that in contrast with the dichotomous decision to revalue assets, where evidence of signalling by successful firms was found at least in some circumstances, no such evidence prevails for the amount of revaluation. As the variable CFDVH does not have a coefficient significantly different from zero, successful firms are not significantly revaluing less, even if the variance in performance within their industry is large. Hence, these results suggest that in industries with a high variance in performance, successful firms do engage in signalling, but they use as the signal forbearance of the revaluation option rather than to revalue less. Although this dichotomous choice is a more costly signal for them, it has the advantage that it can be more clearly interpreted by the receivers and hence may prove to be a more effective signal. There are also other remarkable results. While the decision to revalue assets was not determined by the importance of the fixed and financial assets in the balance sheet, companies that have a higher share of fixed and financial assets will revalue a significantly larger share of these assets, as the significantly positive coefficient of FFA/TA in model (11) demonstrates. Also debt owed to banks shows up significantly (p-value of 0.0198). The amount of revaluation is lower for companies where the share of debt owed to banks is higher. Firms apparently take into account that it is more difficult to mislead banks, as compared to other users of the financial statements. The hypothesis for the legal covenant is also confirmed. The legal convenant is only important for firms which are (close to) violating the legal requirements. Only for these firms, as the net worth decreases, firms are more likely to revalue assets. While the size of the firm determined the decision to revalue assets, it does not influence the amount of revaluation as a percentage of assets (p-value of 0.4497).

5. Conclusions

The signalling function of non-revaluation of assets is studied in an environment, where the probability of raising investment funds depends on the firm's current financial position as well as the expected success of its projects. As the non-revaluation of assets results in decrease of the net worth, the probability of violating the minimum legal covenant with respect ot the net worth increases. Therefore, non-revaluation of assets results in an increase of the expected reorganisation costs. At the same time however, the probability of receiving funds can increase when abstaining from revalution, when

investors believe non-revaluers to be more successful. A separating equilibrium, where only the successful firms do not revalue assets, can be reached because the signalling costs, the increase in expected reorganisation costs, is smaller and the signalling revenue, the increase in the expected cash flows is larger for the successful firms. Large variance in performance within the industry as well as a low equity-to-debt level were shown to be more favorable conditions for signalling by successful firms.

Testing these hypotheses on Belgian data revealed that the use of revaluation as a signalling device is restricted. Only in industries with a large variance in performance or sufficiently low equity-to-debt ratios were more successful firms found to have a higher probability of not revaluing their assets. While no significant effect was found on the amount of revaluation, the decision to not revalue assets seems to be an efficient signal for successful firms, rather than the amount of revaluation. The impact of a firm's success on the incentives to revalue persist even if classical contracting motives are included in the empirical analysis. Firms, which violate the legal convenant or are close to covenant violation are more likely to revalue assets when their net worth is lower, while those which are not close to covenant default, are not more likely to revalue when their net worth decreases.

The results reported here should not be interpreted as suggesting that signalling motives are crucial in the revaluation decision. Without any direct assessment of motives for revaluation , the use of cash flows to test the signalling hypotheses calls for a more cautious stance when interpreting the results. Other reasons why firms with higher cash flows are less likely to revalue cannot be excluded. The main contribution of the paper is in theoretically identifying the circumstances in which signalling by successful firms may be more powerful. In addition, the results are interesting in their ability to indicate avenues for further research. The different results for the dichotomous versus the continuous revaluation choice should lead to a conclusion that when firms want to eliminate asymmetric information, they are clearly considering the efficiency of signalling devices, trading off the net (opportunity) cost of using the signal versus the impact on the investors' beliefs, where the latter may be specific for the type of investor, eg banks versus other agents. However, more theoretical and empirical work should be done on the choice of signalling device, extending the scope of instruments to other accounting devices as well as financial instruments.

Although robustness was seen within the sample, clearly more empirical work is necessary on other samples to validate the results. Also more work should be done to

improve the theoretical and empirical assessment of variables included in the explanation of the revaluation decision.

APPENDIX

Proposition 1: The revaluation of assets results in a decrease in the expected reorganisation costs, c.p.

$$TER_t(\check{s}_H, R = R1) - TER_t(\check{s}_L, R = M) > 0 \qquad (A.1)$$

From using expression (3) for TER, it can easily be established that LHS of (A.1) is equal to $((1-p^{nf})\exp -bs_t + p^{nf})*\exp -bE/D*(\exp -bR/D - \exp -bM/D)$. The first two terms are positive. Also the last term is negative when R<M. QED.

Note that the proposition already follows from the fact that $\partial TER/\partial R<0$

As the amount of revaluation R1 decreases, the effect on the deterioration of the financial structure is larger. As the difference between the cash flows increases, the difference between the expected reorganisation costs increases, the successful firm gains more from identification as a successful firm and the amount of R1 must be smaller to reach an increase in the expected reorganisation costs.

Proposition 2: The increase in the expected reorganisation costs by choosing a smaller amount of revaluation is larger for s_L

The increase in the expected reorganisation costs by choosing a smaller amount of revaluation R1 < M is larger for the unsuccessful firm when:

$$TER_L(s_H, R= R1) - TER_L(s_L, M) > TER_H(s_H, R = R1) - TER_H(s_L, M) \qquad (A.2a)$$

Proof: Again using the expression (3) for TER, it can easily be established after some rearranging that (A.2) corresponds to

$$\frac{(1 - p^{nf}(\check{s}_H)}{(1 - p^{nf}(\check{s}_L)} > e^{-b(M - R1)/D} \qquad (A.2b)$$

As $p^{nf}(\check{s}_H)$ is smaller than $p^{nf}(\check{s}_L)$, the LHS of (A.3) is certainly larger than 1. The RHS is certainly smaller than 1 because M > R1 and e^{-bx} is smaller than 1 for all values of x. *QED.*

Proposition 3:
The following configuration is a signalling equilibrium (sequential eqiulibrium): A firm of type t=H chooses R1 < M, while a firm of type t=L chooses M. The investors belief $\check{s} = s_H$ *if they observe R=R1. If they observe R=M,* $\check{s}=s_L$.

Proof: That the investor's beliefs are rational given the strategies of firms of both types is easy to see. What remains to be established is whether proposition 3 describes an optimal strategy for firms of both types given investor's beliefs, i.e. whether firms have no incentive to unilaterally deviate.

A firm of type t=H does not want to deviate from R<M when

$$(1-p^{nf}(\check{s}_H))*s_H - TER_H(\check{s}_H, R) \geq (1-p^{nf}(\check{s}_L))*s_H - TER_H(\check{s}_L, M)$$
or
$$(p^{nf}(\check{s}_L) - p^{nf}(\check{s}_H))*s_H \geq TER_H(\check{s}_H, R^*) - TER_H(\check{s}_L, M), \qquad \text{(A.3a)}$$

A firm of type t=L does not want to deviate from R=M when

$$(1-p^{nf}(\check{s}_L))*s_L - TER_L(\check{s}_L, M) \geq (1-p^{nf}(\check{s}_H))*s_L - TER_L(\check{s}_H, R)$$
or
$$(p^{nf}(\check{s}_H) - p^{nf}(\check{s}_L))*s_L \geq TER_L(\check{s}_L, M) - TER_L(\check{s}_H, R). \qquad \text{(A.3b)}$$

Given that R increases expected cash flows, all else equal (see proposition 1), the H-type will select the highest level of revaluation that still satisfies (A.3b): The H-type wants to select an amount of revaluation as high as possible under the condition that the low firm will not mimic its strategy. This amount of revaluation, R*, can be obtained from (A.3b) that holds with equality.

After some rearranging, this yields

$$R^* = D/b*(\ln TER_L(\check{s}_H, R=0) - \ln((p^{nf}(\check{s}_L)-p^{nf}(\check{s}_H))*s_L + TER_L(\check{s}_L, R=M)) \qquad \text{(A.3c)}$$

It still needs to be established that this R* satisfies (A.3a). From proposition 2 we know that the RHS of (A.3c) is larger than $(TER_H(\check{s}_H, R^*) - TER_H(\check{s}_L, M))$. Hence $(p^{nf}(\check{s}_L)-p^{n}{}_L(\check{s}_H))*s_L$ is also larger than $TER_H(\check{s}_H, R^*) - TER_H(\check{s}_L, M)$. With $s_H > s_L$, $.(p^{nf}(\check{s}_L)-$

$p^{nf}(\check{s}_H))*s_H$ is a fortiori larger than $TER_H(\check{s}_H, R^*) - TER_H(\check{s}_L, M)$, which corresponds precisely with (A.3a) *QED*

Condition A3b also shows that R* is smaller than M. The LHS is negative because $(p^{nf}(\check{s}_H) < p^{nf}(\check{s}_L))$. Therefore, the RHS must also be smaller than zero. Because the expected reorganisation costs are larger when the investors believe that it is an unsuccessful firm, R* must be smaller than M to reach a situation, where $TER_H(\check{s}_L, M) < TER_H(\check{s}_H, R^*)$.

It is important to note that there are multiple separating equilibria. In fact all values of R<R* chosen by the H-type would satisfy a fortiori (A.3b). Take for instance the case of a dichotomous choice of R=0 by the H-type, while the L-type prefers R=M. Given that the L-type will not mimic a choice of R=0, not revaluing could be a better strategy for the H-type than to revalue R=M.

In order to have condition (A.3a) satisfied with R=0, note that LHS of (A.3a) is increasing in s_H: $\partial LFS/\partial s_H = (p^{nf}(\check{s}_L) - p^{nf}(\check{s}_H)) - s_H*\partial p^{nf}(\check{s}_H)/\partial s_H > 0$ with $= (p^{nf}(\check{s}_L) - p^{nf}(\check{s}_H)) > 0$ and $\partial p^{nf}(\check{s}_H))/\partial s_H < 0$. The RHS of (A.3a) is decreasing in s_H: while $\partial TER/\partial s < 0$, $|\partial TER_H(\check{s}_L, M)/\partial s_H| < |\partial TER_H(\check{s}_H, 0)/\partial s_H|$. Define s_H^+ to be the level of s_H for which (A.3a) holds with equality. Then with $s_H > s_H^+$ condition (A.3a) will hold.

Hence with s_H large enough, a signalling outcome with the H-type not revaluing, while the L-type revalues the maximum amount M, and the investor's belief structure as in proposition 3, is a sequential equilibrium.

Proposition 4: If the variance in performance in the industry is larger, a separating equilibrium, where the successful firm does not revalue assets, is more easily reached, while R decreases.*

Define $s_H = s_L + \Delta$

The effect on the signalling revenue of a larger difference between s_H and s_L is positive:

$$(p^{nf}(\check{s}_L) - p^{nf}(\check{s}_H))* s_t = \exp\text{-}a(E/D+s_L)(1-\exp(-a\Delta))s_t \qquad \text{(A.4a)}$$

Hence

$$\partial(\text{A.4a})/\partial\Delta = a*(\exp(-a\Delta))*\exp\text{-}a(E/D+s_L), \qquad \text{(A.4b)}$$

which is positive

The effect on the increase in TER of a larger difference between s_H and s_L is negative:

$TER_H(\check{s}_H, R^*) - TER_H(\check{s}_L, M) =$

$C^*\exp-b((E+R)/D+s_t)^*(1-\exp-bP/D+ \exp-a(E/D+s_L)^*(\exp(-a\Delta)-\exp-bP/D))$

where $M=R+P$ (A.4c)

Hence

$\partial(A.4c)/\partial\Delta=-a^*C^* \exp-b((E+R)/D+s_t)^*(\exp-a(E/D+s_L)^*(\exp(-a\Delta)$ (A.4d)

which is negative.

Since signalling revenue increases while the signalling cost decreases when the difference between s_H and s_L is higher, signalling by revaluing less, becomes more attractive. Note that this holds for both types. Since it also holds for the unsuccessful type, it is clear that in order to have a separating equilibrium where the low type is not mimicking the signalling strategy of the successful type, the latter needs to choose a lower level of revaluation to prevent imitation. Indeed it is straightforward to show that R^* is decreasing in Δ:

From (A.3c) it can be shown that $\partial R^*/\partial\Delta < 0$ given that $\partial \ln TER_L(\check{s}_H, R=0)/\partial\Delta < 0$ while $\partial\ln((p^{nf}(\check{s}_L)-p^{nf}(\check{s}_H))^*s_L)/\partial\Delta > 0$ and $\partial TER_L(\check{s}_L, R=M))/\partial\Delta = 0$. QED

From the expressions (A.4b) and (A.4d) it is easy to see that $\partial(A.4b)/\partial s_t > 0$ and $\partial(A.4d)/\partial s_t > 0$. Hence the increase in signalling revenue from a higher variance is larger for the more successful firm. At the same time, the decrease in signalling cost is higher for the more successful firm. Both effects combined, indicate that signalling becomes relatively more attractive for the successful firm than for the unsuccessful firm in industries with a higher variance in success.

Proposition 5: If the equity-to-debt ratio in the industry is higher, a separating equilibrium, where the successful firm does not revalue assets, is less easily reached, while the effect on R is undetermined.*

In a similar spirit the effect of the E/D ratio on the likelihood of establishing a separating equilibrium can be established.

The effect on the signalling revenue of a larger E/D ratio is negative:

$\partial(A.4a)/\partial E/D=-a^*(p^{nf}(\check{s}_L) - p^{nf}(\check{s}_H))^*s_t$ (A.5a)

The effect on the increase in TER of a larger E/D ratio is also negative:

∂(A.4c)/∂E/D=-b*(A.4c)

-a*(C*exp-b((E+R)/D+s_t)*exp-a(E/D+s_L)*(exp(-aΔ)-exp-bP/D)) (A.5b)

A larger E/D ratio decreases the benefits from signalling. At the same time, it decreases the costs of signalling for both types. Consequently, the total effect on the net profitability of signalling is unclear.

Given this, it is easy to see that the effect on R* will also be undetermined.

From (A.3c) it can be shown that $\partial R^*/\partial E/D><0$ given that $\partial \ln TER_L(\check{s}_H, R=0)/\partial E/D <$ 0 while $\partial \ln((p^{nf}(\check{s}_L)-p^{nf}(\check{s}_H))*s_L)/\partial E/D<0$ and $\partial TER_L(\check{s}_L, R=M))/\partial E/D < 0$.

Again from the expression for (A.5a) and (A.5b), it is easy to see that ∂(A.5a)/$\partial s_t < 0$ and ∂(A.5b)/$\partial s_t > 0$. Hence, the decrease in signalling benefits is larger, while the decrease in signalling cost is smaller for the successful firm as compared to the unsuccessful firm. Consequently, a separting equilibrium with the successful firm signalling becomes less likely.

Estimated Correlation Matrix for model 1

Variable	ICPT	CFDVH	CFDVL	DOB	FFA/TA	S	DLawA	DLAWB	HF
ICPT	1.0	-0.39502	-0.09631	-0.03313	-0.50584	0.02436	-0.21084	0.21015	-0.33749
CFDVH	-0.39502	1.0	0.08133	-0.01160	0.13174	0.05015	-0.04096	-0.33861	0.05236
CFDVL	-0.09631	0.08313	1.00000	0.06007	0.02904	-0.06176	-0.06215	-0.01900	-0.06028
DOB	-0.03313	-0.01160	0.06007	1.00000	-0.39155	-0.26565	0.01010	0.11143	-0.00309
FFA/TA	-0.50584	0.13174	0.02904	-0.39155	1.00000	0.08594	-0.03074	0.05133	-0.23982
S	0.02436	0.05015	-0.06176	-0.26565	0.08594	1.00000	-0.00145	-0.14902	-0.37189
DLawA	-0.21084	-0.04096	-0.06215	0.01010	0.03074	-0.00145	1.00000	-0.15259	-0.02304
DLawB	0.21015	-0.33861	-0.01900	0.11143	0.05133	-0.14902	-0.15259	1.00000	0.03857
HF	-0.33749	0.05236	-0.06028	-0.00309	-0.23982	0.37189	-0.02304	0.03857	1.00000

REFERENCES

Bar-Yosef , Hughes P., Venezia I., The LIFO-FIFO choice as a signal of future costs, *Journal of Management Accounting Research*, 1995, Vol. 7, 52-65

Beneish M.D., Press E., Costs of technical violation of accounting -based covenants, *The Accounting Review*, 1993, Vol. 68, 233-257

Bowen R., Noreen E., Lacey J., Determinants of corporate decision to capitalize interest, *Journal of Accounting and Economics*, 1981, Vol. 3, 151-179

Brown P., Izan H.Y., Loh A.L., Fixed asset revaluations and managerial incentives, *Abacus*, Vol. 28, 1992, 36-57

Cramer J.S. The logit model, Edward Arnold, 1991, 108 p.

Easton P. Eddey P.H., Harris T.S., An investigation of revaluations of tangible long-lived assets, *Journal of Accounting Research*, 1993, 1-37

Emanuel D., Asset revaluation and share price revisions, *Journal of Business Finance and Accounting*, Spring 1989, 213 - 227

Gibbons R., A primer in game theory, Harvester Wheatsheaf, 1992, 267 pp.

Henderson S. Goodwin J. The case against asset revaluations, *Abacus*, Vol. 28, 1992 75-87

Hunt H. Potential determinants of corporate inventory accounting decisions, *Journal of Accounting Research*, 1985, Vol. 23, 448-467

Meyers, S. and N. Majluf, Corporate financing and investment decisions when firms have information that investors do not have, *Journal of Financial Economics*, 1984, Vol. 13, 187-221

Sharpe I. Walker R. Asset revaluations and stock market prices, *Journal of Accounting Research*, Autumn 1975, 293-310

Standish P. Ung S. Corporate signalling, asset revaluations andthe stock prices of British companies, *The Accounting Review*, October 1982

Walker R.G., The Sec's Ban on upward asset revaluations and the disclosure of current values, *Abacus*, 1992, Vol. 28, 3-35

Watts R., Zimmerman J., Positive accounting theory: a ten year perspective, *The Accounting Review*, 1990, Vol. 65, 131-156

Whittred G. Chan Y.K., Asset revaluations and the mitigation of underinvestment, *Abacus*, Vol. 28, 1992, 49-64