

**CUE286 - REAL EFFECTS OF ALLOWING IMPAIRMENT LOSSES  
REVERSALS**

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**Resumo**

We use a theoretical model to analyze how impairment loss reversal option affects economy efficiency and manager behavior. We found that it increases manager leniency and reduces manager rigorousness about possible assets' bad financial condition. A manager that is allowed to reverse impairment losses makes less effort to identify impairment necessity. Allowing such reversals increases short-term inefficiency but it is reversed to a long-term efficient allocation.

## REAL EFFECTS OF ALLOWING IMPAIRMENT LOSSES REVERSALS

### ABSTRACT

We use a theoretical model to analyze how impairment loss reversal option affects economy efficiency and manager behavior. We found that it increases manager leniency and reduces manager rigorousness about possible assets' bad financial condition. A manager that is allowed to reverse impairment losses makes less effort to identify impairment necessity. Allowing such reversals increases short-term inefficiency but it is reversed to a long-term efficient allocation.

**Key-words:** impairment loss reversal; trade-off; information asymmetry; funding.

### 1 INTRODUCTION

This paper concerns on whether allowing impairment losses reversals have a significant impact on firm funding capability. The flow of information between firm and investors is a capital factor on resources allocation and economic efficiency. Moreover, timeliness as a factor of report quality makes impairment and impairment reversals an important aspect of corporate governance. Manager discretionary power over impairment decisions might be used for earnings management. We examine if allowing managers to reverse impairment losses has an impact on credit market.

There are two major accounting standards worldwide, IFRS and USGAPP and they have taken different stances with respect to reversals. In the US, reversals are prohibited for most assets<sup>1</sup>, while IFRS requires reversals if economic conditions no longer require to impair the asset. With the continuing convergence of US GAAP and IFRS the current trend greater use of current price in accounting standards, a more complete evaluation of the economic consequences of impairment reversals may help frame existing debates.

In this paper, we develop a model of impairment reversals around the real effect auditing setting of Lu and Sapra (2009). The model consists in an economy with two agents, managers and investors. This economy could be under one of two accounting standards that differs from each other by allowing or not to reverse impairment losses. We call them Reversal Accounting and Non-Reversal Accounting respectively. Nature draws an unobserved financial condition for firms' assets that impact directly on the necessity of impairment. Managers might make an effort and observe asset financial condition. If the effort made is not enough, she gets inconclusive evidences.

Afterwise, manager need to release a report that will signal assets financial condition to the market. We define managers' types as lenient or rigorous if she releases a good or bad report when have inconclusive evidences respectively. Investors observes the report and creates beliefs about real financial condition according to managers types, and prices the firm. At the end, the true financial condition is revealed to uninformed managers and a second round of reports retracting a bad impairment are released if firm is under Reversal Accounting.

Informational flow has a direct impact on the economic environment and can impact directly on how firms get funding or which projects are implemented and which ones are not. Information asymmetry is an important circumstance of adverse selection on credit markets, resulting on economic inefficiencies.

We found that allowing impairment losses reversals increases manager space of rigorousness and reduces space of leniency. Moreover, it also reduces how much effort the manager implements to identify impairment necessity and more bad impairments are made. We

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<sup>1</sup> Both standards allow assets to be fair-valued (there are differences between which assets on each standard). However, for the sake of comparability, we consider only book-value accounting, and this has no impact on our model.

also found under-investment when a lenient manager releases a good report and when a rigorous manager releases a bad one. The economic inefficiency is similar with leniency on both accounting standards and is greater for Reversal Accounting with manager rigorousness. We contribute for the literature showing an aspect of information acquisition that has been neglected.

The paper goes as follows: Section 2 presents a literature review and Section 3 presents the model, section 4 and 5 presents the results for Non-Reversal Accounting and Reversal Accounting respectively. Section 6 concludes.

## **2 LITERATURE REVIEW**

Biddle, Hilary and Verdi (2009) finds evidence of negative relation between information quality and investment efficiency. They found that the increase of report quality reduces economic frictions that constrain economic efficiency. Chen, Hope, Li, and Wang (2011) brings evidence that financial report quality increases investment throughout bank financing. Zhang (2013) use a CAPM setting to investigate the relation between accounting standards, investment level and welfare. The model presents that accounting standards matter not only because quality affects but also because investment level. The results also suggest that an improvement on accounting standards causes a shift on resources allocation across firms and economic growth.

Lambert, Leuz, and Verrecchia (2007) shows that quality of information has a direct and indirect impact on cost of capital and an increase in information quality reduces cost of capital. Therefore, information quality enables more good projects to be funded and impact economic growth. Easley and O'hara (2004) investigates the relation between information and cost of capital and finds that the choice of accounting treatment influences cost of capital and investors demand higher stock return from firms with greater private information.

Ball, Kothari, and Robin (2000) shows that differences about accounting standards across countries affects firm value over time. Daske, Hail, Leuz, and Verdi (2008) investigates the mandatory adoption of IFRS and found increase of liquidity, decrease of cost of capital and increase of equity valuations. Horton, Serafeim, and Serafeim (2012) examines IFRS adoption improved quality on credit market and firms' information environment increasing comparability and information quality. Soderstrom and Sun (2007) discussed how the mandatory IFRS adoption by European companies. They argue that accounting quality is a function of each country institutional setting. Hence the impact of IFRS adoption should not be major on accounting quality.

Gigler, Kanodia, Sapa, and Venugopalan (2009) investigate how accounting conservatism affect debt contracts They found that optimal covenants vary with the degree of conservatism and that accounting conservatism decreases debt contracts efficiency. Gox and Wagenhofer (2009) presents a theoretical model analyzing the optimal impairment rule and find that is conditional conservative. Gox and Wagenhofer (2010) argued that investors prefer a conservative accounting system and fair value measurement increases accounting risk.

Kanodia (2007) analyzed real effects on accounting disclosure and finds that how firms' transactions are measured and reported has a real an important effect on resources allocation. This result highlights how important is the choice of how to disclose financial accounting measures. Rennekamp et al. (2014) conducted experiments about reversal of impairment losses. The result suggests that when responsible for the decision of write-off, manager invest more attempting to reverse cash flow outcome. The result is not similar when manager is not responsible for the write-off, indicating a behavior might not consistent with stockholders' interests.

## **3 THE MODEL**

This paper is an adaptation of Lu&Sapa 2009.

The model has one period and it is set as follows. Consider an economy with two types of agents: Managers, that own firms, and investors that price them. This economy may adopt two different accounting standards: one allows impairment losses reversals and the other does not. We will denote them Reversal Accounting and Non-Reversal Accounting respectively.

The timeline for the model consists of 3 steps, presented in Figure 1. At first Nature draws a good state with probability  $\lambda$ , or a bad state with probability  $1 - \lambda$ , where  $\Delta\lambda = (1 - \lambda) - \lambda$ . On the first step, a Manager from a representative firm might make an effort to be informed about nature state. (Figure 1). Finally, firm can make two reports about assets values,  $Y_G$  if that is no need for impairment or  $Y_B$  if the asset is impaired.

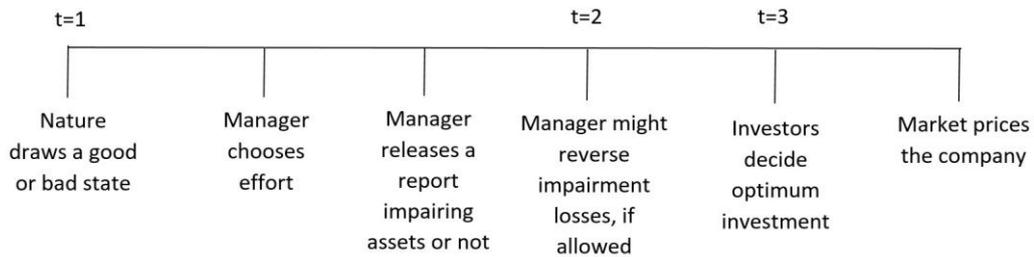


Figure 1: Timeline

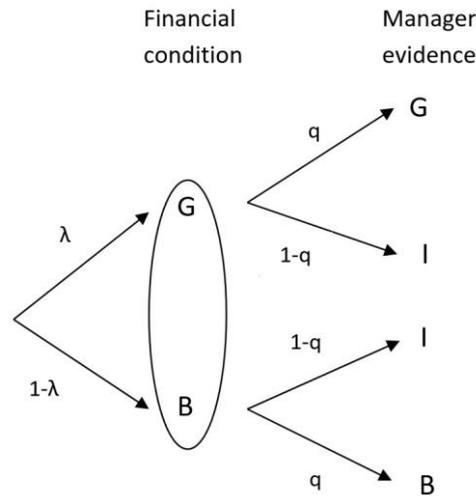
Manager chooses to make effort to accumulate evidences and identify assets financial condition as  $G$  or  $B$  with probability  $q \in [0, 1]$ . If she chooses to make not enough effort, ends with inconclusive evidences  $I$  (Figure 2). We refer to the probability of identify assets financial condition as effort given the interdependency of the both. The cost of effort,  $c(q)$ <sup>2</sup>, is increasing and convex, with  $c(0) = 0$ ,  $c'(0) = 0$  and  $c'(1) = \infty$ <sup>3</sup>. Manager can assume two types. We define managers' types as Rigorous if she chooses to impair the asset when she is not certain whether the asset should be impaired and Lenient if only impairs when is certain about state of nature. Investors can observe managers types. Whenever a manager releases a wrong report, she is given wrong information and misleading investors, i.e. reports  $Y_B$  if  $G$  or  $Y_G$  if  $B$ . Thus, we assume an expected liability  $L$  that may be imposed on managers when they make the wrong choice, where  $E(L) > 0$ <sup>4</sup>.

On step 2, manager is fully informed about nature state and perfectly identify whether should had impair the asset in the first place. In case that impairment have been made when it shouldn't, she can reverse losses if allowed. The firm has an investment opportunity and needs external funding. In case of good state, the investment will generate a return  $2\mu\sqrt{k}$  or 0 otherwise. If the firm is allowed to reverse impairment losses, investors wait for managers' report before making any investment decision.

<sup>2</sup> There is an implicit cost of making impairment reversals that is considered by the managers. In order to keep the model simple, we assume that the present value of this implicit cost is considered when deciding how much effort to implement to seek evidences to impair the asset or not.

<sup>3</sup> Following Lu and Sapra (2009)

<sup>4</sup> This liability could be seeming as the expected value of a lawsuit



**Figure 2: Information acquisition**

The value of the firm,  $M$ , depends on state of nature. Finally, the third step consists on investors deciding the investment and pricing the firm. Investors knows managers' types and creates beliefs about asset financial condition. We call  $Z$  investors' information set including managers' effort, type and report, i.e.  $Z = [q, T, Y_i]$ . Using this information, he identifies optimum investment and market prices the firm. We call  $\Phi$  and  $\varphi$ , firm value in a good report and in a bad report respectively where  $\Delta M = \Phi - \varphi$  is the difference between firms' possible expected values.

**Definition 1** *The ratio of the difference between firms' possible values and the liability is called fee-liability ratio,  $\frac{\Delta M}{L} = \frac{\Phi - \varphi}{L}$ .*

Managers' payoffs are defined by firms' expected value less any expected liability by releasing of bad reports. Managers choose what report to give according to which expected payoffs they face when making the decision. Manager chooses the effort that will maximize payoff function, given which report were released and her type. If impairment losses reversals are allowed, manager faces two payoffs matrix. The first is at the point to decide whether to impair the asset or not. The second is whether to reverse impairment loss or not. She can observe that and solve using backward induction to her first decision point.

$$\text{Manager payoff } \{ \sum_{i=1}^3 \Pr(\text{State}) E(\text{payoff}_i | \text{State}, \text{type}) \}$$

Following Lu and Saprà (2009), we assume that the real condition of the asset is not perfectly identified by the market. Thus, to create their beliefs about assets financial condition, investors infer Bayesian probabilities of good condition given available information. We will denote this probability by  $p$ , i.e.,  $p = \Pr(G|Z)$ . Investors choose to maximize their expected return,  $p2\mu^2\sqrt{k} - k$ , and is easy to see that,

$$k^* = p^2\mu^2 \quad (1)$$

Moreover, let's suppose that the state of nature is fully informed. Thus, the manager will always make the right choice about impairment and the investor, being fully informed, makes his first-best choice of investment. We can find from equation 1 that the optimal investment would be  $k_G^{FI} = \mu^2$  and  $k_B^{FI} = 0$ .

**Definition 2** We call investment inefficiency whenever investors overinvest or underinvest given information asymmetry around asset financial condition.

Furthermore, we look how investors price firms. We assume that capital markets are competitive, thus it is going to price the firm as the expected return on the investment plus the penalty for damage caused by managers' wrong choices.

### 3.1 Non-Reversal Accounting

Under this accounting standard manager only are allowed to reevaluate asset downward. Manager decides which report to release according to her evidences about nature state and her type (Figure 3).

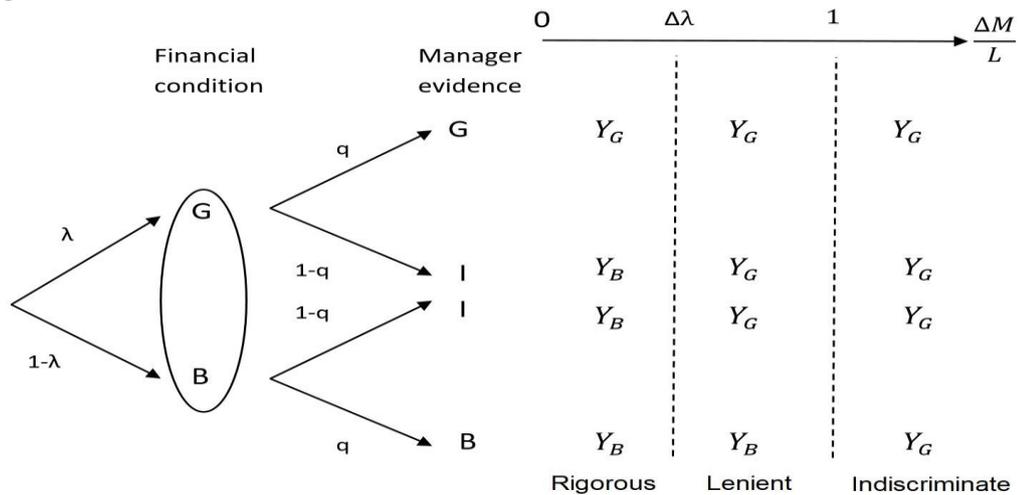


Figure 3: Report disclose conditions

Table 1 presents the payoffs. We can see the expected payoff crossing evidences with each report that can be given. Last column presents the condition when manager decides to give a good report and not impair the asset. Rationally, she would prefer not to make an impairment if and only if value of the asset less any expected liability is greater than value of impaired asset less any expected onus.

Table 1: Payoffs

Evidence	$Y_G$	$Y_B$	$Y_G$ If and only if
G	$\Phi$	$\varphi - L$	$\frac{\Delta M}{L} \geq 0$
I	$\Phi - (1 - \lambda)L$	$\varphi - \lambda L$	$\frac{\Delta M}{L} \geq \Delta \lambda$
B	$\Phi - L$	$\varphi$	$\frac{\Delta M}{L} \geq 1$

It is easy to see that managers' choice of report will depend directly on her expectation of payoff. Her choice will always take into consideration how much more her firm will be priced after a good report other than a bad report considering how much liability she might take by given a wrong report (Figure 3).

#### Claim 1

- i) When  $\frac{\Delta M}{L} < \Delta\lambda$  manager will always impair the asset, unless the evidence is G in which case she won't.

- ii) When  $\frac{\Delta M}{L} \in [\Delta\lambda, 1]$  manager will never impair the asset, unless the evidence is B in which case she will.
- iii) When  $\frac{\Delta M}{L} \geq 1$  manager will never impair the asset

### 3.1.1 Choice of Impairment Effort

Manager decides what effort to do to identify impairment necessity focusing on maximizing her utility. From figure 3 and table 1 we can see her payoffs according to her type and which reports are release.

- Manager rigorousness ( $\frac{\Delta M}{L} < \Delta\lambda$ )

Manager always impair the asset except when she observes evidence G, in which case firm value would be  $\Phi$ . Manager expected payoff is as follows:

$$\lambda\Phi q + (1 - q)(\varphi - \lambda L) + (1 - \lambda)q\varphi - c(q) \quad (2)$$

- Manager leniency ( $\frac{\Delta M}{L} \in [\Delta\lambda, 1]$ )

A Lenient manager,  $\frac{\Delta M}{L} \in [\Delta\lambda, 1]$ , never impair the asset, unless the evidence is B. Thus, if the evidence is G, she collects the fee  $\Phi$ ; if her evidence is I she will receive  $\Phi - (1 - \lambda)L$  with probability  $\lambda$ . Therefore,

$$\lambda\Phi q + (1 - q)(\Phi - (1 - \lambda)L) + (1 - \lambda)q\varphi - c(q) \quad (3)$$

- Indiscriminate report ( $\frac{\Delta M}{L} \geq 1$ )

We can see from figure 1 that when  $\Delta M > L$  the manager will never impair the asset. Thus, she always receives  $\Phi$  and have a liability risk of  $(1 - \lambda)$ .

$$\Phi - (1 - \lambda)L - c(q) \quad (4)$$

Therefore, we can take the derivative of each utility function above to find first order conditions, indicating managers' optimum choice of effort.

**Claim 2** The manager supply of impairment quality,  $q$ , is characterized as follows:

- i) Rigorous manager  
 $c'(q) = \lambda M + \lambda L$
  - ii) Lenient manager
- (5)

(6)

$$c'(q) = (1 - \lambda)(L - \Delta M)$$

iii) *Indiscriminate manager*

$$c'(q) = 0 \quad (7)$$

Manager chooses effort to maximize payoff given her type, although it could mean to choose to make an effort lower than expected by investors. To find the optimum effort choice, we just need to invert the cost of effort function and isolate  $q^*$ . Thus, we can conjecture from claims 2 that:

**Lemma 1** *Not allowing impairment losses reversals enhances the following effort to identify impairment necessity:*

i) *Rigorous manager*

$$q^* = c'^{-1}(\lambda (M + L))$$

ii) *Lenient manager*

$$q^* = c'^{-1}((1 - \lambda) (L - \Delta M))$$

iii) *Indiscriminate manager*

$$q^* = c'^{-1}(0)$$

### 3.1.2 Price and Investment

Now, we turn to see how the market prices the firm. Investors observe managers' types based on previous actions and create beliefs about asset financial condition, accordingly with managers' types, actions and accounting standard. Using these beliefs, investors identify optimum investment and prices firms.

From figure 3, we can see how managers construct their Bayesian probabilities based on the relation between firm value and liability. Plugging each Bayesian probability into equation 1, we can find the investors' choice of investment, given their beliefs of asset financial condition.

**Claim 3** *For a given impairment quality  $q$ , we have the following optimal investment from equation 1:*

$$k(y_G, R, q^*) = \mu^2$$

$$k(y_B, R, q^*) = \left[ \frac{\lambda(1 - q^*)}{1 - \lambda q^*} \right]^2 \mu^2$$

$$k(y_G, Le, q^*) = \left[ \frac{\lambda}{1 - (1 - \lambda)q^*} \right]^2 \mu^2$$

$$k(y_B, Le, q^*) = 0$$

**Remark 1** *Investors under-invest when Lenient managers impair the asset and when Rigorous managers choose not to.*

We see that whenever uncertainty exists, investors are more cautious and choose to withhold investment. Hence, this behavior leads to underinvestment and creates economic inefficiency. Furthermore, we compute firms' value  $M$ . Investors price firms as investment expected return plus liabilities from bad managers decisions.

**Claim 4** *When managers are not fully informed by asset financial condition, market prices the firm as follows,*

$$\varphi_{NR,G,R} = E[M(y_G, R, q^*)] = \mu^2$$

$$\varphi_{NR,B,R} = E[M(y_B, R, q^*)] = \left[ \frac{\lambda(1 - q^*)}{1 - \lambda q^*} \right]^2 \mu^2 + \frac{\lambda(1 - q^*)}{1 - \lambda q^*} L$$

$$\Phi_{NR,G,Le} = E[M(y_G, Le, q^*)] = \left[ \frac{\lambda}{1 - (1 - \lambda)q^*} \right]^2 \mu^2 + \frac{(1 - \lambda)(1 - q^*)}{1 - (1 - \lambda)q^*} L$$

$$\Phi_{NR,B,Le} = E[M(y_B, Le, q^*)] = 0$$

### 3.2 Reversal Accounting

Under Reversal Accounting, managers decide to report whether to impair assets but can reverse impairments on the future. Managers are less committed with their report since they might revise and amend.

Allowing for impairment reversals will affect managers' payoffs, as described in Table 02. Manager will reverse impairment in two situations: one, if and only if there is evidence that the assets are indeed good enough to keep the project and generate positive future cash flows; two, if the reversal is greater than any liability. This is common knowledge. Furthermore, at first manager uses this information to make her first decision on which report to give in the first place.

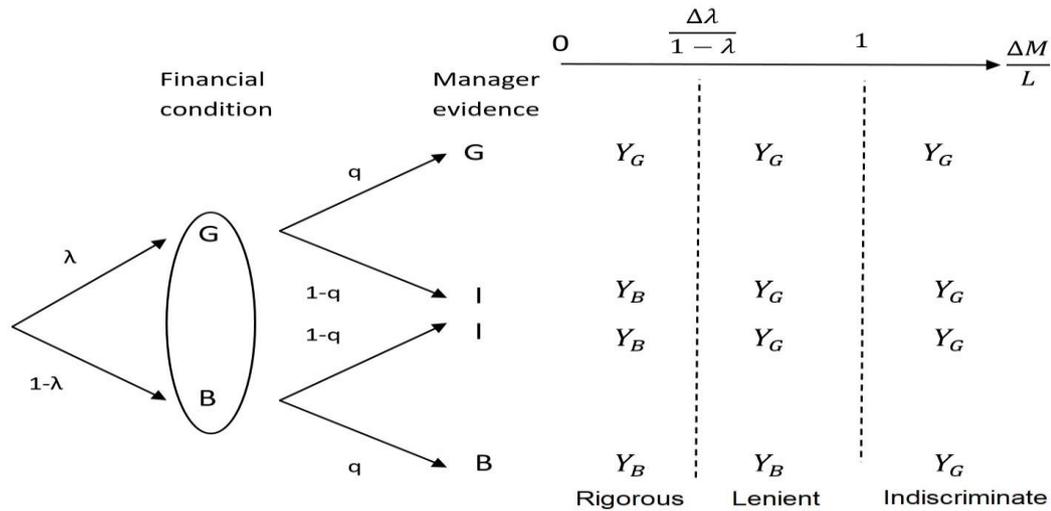


Figure 4: Report conditions

Table 2 shows managers' criteria to decide whether to ratify her previous report and reverse impairment losses. She reverses impairment if the firm value gained by a good report would exceed the liability she might take.

Table 2: Payoffs

Evidence	Re	NRe	Re if and only if
G	$\Phi - L$	$\varphi - L$	$\frac{\Delta M}{L} \geq 0$
B	$\Phi - L$	$\varphi$	$\frac{\Delta M}{L} \geq 1$

We can see from payoffs on table 2 that facing good evidences and knowing that she made a bad impairment, she is better off reversing impairment losses. On the other hand, if the manager is sure that the impairment, she made was correct (she gets evidence B), she will only reverse losses if the gain on firm value exceeds her liability.

**Claim 5**

- i) Manager will always reverse impairment losses when is clear that she should.
- ii) Manager would make a wrong impairment loss reversal if and only if  $\frac{\Delta M}{L} \geq 1$ .

Table 3 shows the payoffs at the point where manager decides to impair the asset or not, solving for backward induction her future decision on whether to reverse impairment losses or not.<sup>5</sup>

<sup>5</sup> We can see on Table 3 the payoffs manager would face by solving for backward induction. For the sake of simplicity, we consider liabilities as the same.

Table 3: Payoffs

Evidence	$Y_G$	$Y_B$	$Y_{BRe}$	$Y_G$ If and only if
G	$\Phi$	$\varphi - L$	$\Phi - L$	$\Phi \geq 0$
I	$\Phi - (1 - \lambda)L$	$\varphi$	$(1 - \lambda)\varphi + \lambda(\Phi - L)$	$\frac{\Delta M}{L} \geq \frac{\Delta \lambda}{1 - \lambda}$
B	$\Phi - L$	$\varphi$	$\Phi - L$	$\frac{\Delta M}{L} \geq 1$

Interestingly, from Tables 1 and 3, we can see that managers' impairment criteria shifted. We can see that the space of rigorousness increases when we consider impairment reversal option (Figure 4). Manager is more predisposed to make impairments when has inconclusive evidences<sup>6</sup>. There is an increase of rigorousness and a decrease of leniency as a result of giving more discretionary power to managers.

**Proposition 1** *Allowing impairment losses reversals increases managers' rigorousness and reduces managers' leniency.*

An interesting consequence of allowing impairment reversals is that more assets with good financial condition are impaired but less over valued assets are found in the balance sheet (Figure 4).

**Corollary 3** *Allowing impairment loss reversals reduces the likelihood of overvalued balance assets on balance sheets.*

### 3.2.1 Choice of Effort

When managers are allowed to reverse impairment losses, they keep choosing effort to maximize expected firm value according to her type. From table 3 and figure 4 we can identify expected firm value function according to managers' type.

- Manager Rigorousness ( $\frac{\Delta M}{L} < \Delta \lambda$ )

Again, manager always impair the asset unless she finds evidence G. However, because of reversals firms' expected value when she has evidences I and reports  $Y_B$  changes. The new expected payoff is

$$\lambda q \Phi + (1 - q) \{ (1 - \lambda) \varphi + \lambda (\Phi - L) \} + (1 - \lambda) q \varphi - c(q) \quad (8)$$

- Manager Leniency ( $\frac{\Delta M}{L} \in [\Delta \lambda, 1]$ )

A Lenient manager, when  $\frac{\Delta M}{L} \in [\Delta \lambda, 1]$ , never impair the asset, unless the evidence is B. Thus, if the evidence is G, she collects the fee  $\Phi$ ; if her evidence is I she will receive  $\Phi - (1 - \lambda)L$  with probability  $\lambda$ . Therefore,

$$\lambda \Phi q + (1 - q) (\Phi - (1 - \lambda)L) + (1 - \lambda) q \varphi - c(q) \quad (9)$$

- Indiscriminate report ( $\frac{\Delta M}{L} \geq 1$ )

<sup>6</sup> We can see it from the firm-difference-liability ratio on Figures 3 and 4.

We can see from figure 1 that when  $\Delta M > L$  the manager will never impair the asset. Thus, she always receives  $\Phi$  and have a liability risk of  $(1 - \lambda)$ .

$$\Phi - (1 - \lambda) L - c(q) \quad (10)$$

**Claim 6** *The manager supply of impairment quality,  $q$ , is characterized as follows:*

i) *Rigorous manager*

$$c'(q) = \lambda L \quad (11)$$

ii) *Lenient manager*

$$(12)$$

$$c'(q) = (1 - \lambda)(L - \Delta M)$$

iii) *Indiscriminate manager*

$$c'(q) = 0 \quad (13)$$

One more time we can identify managers' optimum effort. We can see from claim 7 that:

**Lemma 2** *Managers maximize payoff choosing effort such as:*

i) *Rigorous manager*

$$q^* = c'^{-1}(\lambda L)$$

ii) *Lenient manager*

$$q^* = c'^{-1}((1 - \lambda)(L - \Delta M))$$

iii) *Indiscriminate manager*

$$q^* = c'^{-1}(0)$$

We can easily find by comparing lemmas 1 and 2 a relation between the possibility of reverse losses and the effort choice to identify asset financial condition. Once a Rigorous manager is allowed to reverse losses, she chooses to make less effort.

**Proposition 2** *If impairment loss reversals are allowed, Rigorous managers make less effort to identify if they should impair long-lived assets*

### 3.2.2 Price and Investment

We first see optimum investment and firm value after impairment decision takes place and second, we do the same after the reversal option are considered. Investors price firms using the available information according to their beliefs about firm financial condition. The mechanism is the same independently of which accounting standard the economy is under. What happens is an impact of how the flow of information is set and how this might change manager behavior (type space).

From Figure 4 we can identify each Bayesian probabilities and we can see optimum investment plugging these Bayesian probabilities in equation 1.

**Claim 7** For a given impairment quality  $q$ , we have the following optimal investment from equation 1:

$$k(y_G, R, q^*) = \mu^2$$

$$k(y_B, R, q^*) = \left[ \frac{(1 - q^*)}{1 - \lambda q^*} \right]^2 \mu^2$$

$$k(y_G, Le, q^*) = \left[ \frac{\lambda}{1 - (1 - \lambda)q^*} \right]^2 \mu^2$$

$$k(y_B, Le, q^*) = 0$$

Comparing claim 7 with first-best investment presented on equation (1), we can identify economic inefficiency from lack of investment given uncertainty.

**Remark 2** Investors under-invest when Rigorous managers impair the asset and when Lenient managers choose not to.

Comparing claims 3 and 7 we can see that there is a direct relation between allowing managers to reverse impairment losses and the information given to the market. This relation affects investors' investment decisions and its efficiency. Specifically: investors' choice of investment and the inefficiency resulted from it.

**Lemma 3** When a Rigorous manager impair the asset, inefficiency is greater if impairment loss reversals are not allowed

Investors are aware that if a Rigorous manager are more likely to make a wrong impairment. Thus, if she is not allowed to reverse impairment losses, making a wrong impairment means to deal with irreparable losses. Hence, investors hold back more investments for Rigorous managers if they are not allowed to reverse losses than if they have the option to restate asset value.

**Claim 8** Before any chance of impairment losses reversal market prices the firm as follows,

$$\varphi_{R,G,R} = E[M(y_G, R, q^*)] = \mu^2$$

$$\varphi_{R,B,R} = E[M(y_B, R, q^*)] = \left[ \frac{(1 - q^*)}{1 - \lambda q^*} \right]^2 \mu^2 + \frac{\lambda(1 - q^*)}{1 - \lambda q^*} L$$

$$\Phi_{R,G,Le} = E[M(y_G, Le, q^*)] = \left[ \frac{\lambda}{1 - (1 - \lambda)q^*} \right]^2 \mu^2 + \frac{(1 - \lambda)(1 - q^*)}{1 - (1 - \lambda)q^*} L$$

$$\Phi_{R,B,Le} = E[M(y_B, Le, q^*)] = 0$$

From Claim 8 we can see the following: when the market knows that although the manager impaired the asset, if she made a bad choice, she is allowed to take it back and restate the asset full value. This option represents the opportunity that a given asset may be reported with true value. From claim 5 we can see that market prices impairment reversal options.

**Lemma 4** *Market prices differently firms depending on the accounting standards*

**Proposition 3** *Allowing impairment loss reversal has a positive impact on short-term firm value, considering an impairment made by a Rigorous manager*

#### 4 CONCLUSION

We saw in this paper a model that highlights consequences of allowing impairment losses reversals. We looked to a simple model that points out pros and cons on given such discretion to managers. We found that allowing reversals of impairment losses induces managers to make less effort to identify impairment necessity and increases the number of bad impairments. We saw that market prices firms differently depending on the accounting standard.

Allowing reversals reduces leniency, produces less inefficiency and firms' prices are higher with manager rigorousness. Nevertheless, managers can benefit from it on short-term. This paper can contribute to real effects literature. More information ex-post tends to change the type of information produced and investment allocation decision.

Accounting regulators can also benefit from the insights we found in the way to enhance the discussion and refine accounting standards. Thus, how does this theory apply outside of the highly disciplined conditions of a purely academic environment? Well, we have today a movement from the GAPPs standard to IFRS. What we discuss in this paper is a matter that can be seen as one of the differences between the two standards and may be used for regulators to evaluate matters of efficiency on the standard. It also may give some insights about firm disclosures behaves to regulators and policy makers.

Leaving aside the particularities of performing the impairment test, the IFRS gives the manager the possibility of reversing losses when a better scenario arises. The US-GAPP is more rigid and once the loss is recognized, the manager cannot go back, so it is best advised to only make an impairment when certain about it. As this is a discretionary decision, the external agent may be suspicious about the reported value and a scenario of distrust could be created, which can result in adverse selection in the debt market.

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## Appendix

- Claim 1

The conditions to manager release a good report If evidence is G, she will always release  $Y_G$

$$\Phi > \phi > \phi \quad L \Rightarrow \Phi \quad \phi > L \Rightarrow \frac{\Phi - \phi}{L} > 1 \Rightarrow \frac{\Delta M}{L} > 0$$

Because  $\Phi$  is strictly greater than  $\phi$  and L is greater than zero by assumption, it is always true.

If evidence is I, she will release  $Y_G$  if

$$\Phi - (1 - \lambda)L > \phi - \lambda L \Rightarrow \Phi - \phi > [(1 - \lambda) - \lambda]L \Rightarrow \frac{\Delta M}{L} > \Delta \lambda$$

If evidence is B she will release  $Y_G$  if

$$\Phi - L > \phi \Rightarrow \Phi - \phi > L \Rightarrow \frac{\Delta M}{L} > 1$$

- Claim 2

comes straightforward from taking the first derivative of  $q$  on each payoff function

- Lemma 1

from each expression on Claim 2, invert function  $c$  and get  $q^*$

- Claim 3

The Bayesian probabilities are summarized as follows

$$\Pr(G|y_G, Le, q) = 1$$

$$\Pr(G|y_B, Le, q) = \left[ \frac{\lambda(1-q)}{1-\lambda q} \right]^2$$

$$\Pr(G|y_G, R, q) = \frac{\lambda}{1 - (1-\lambda)q}$$

$$\Pr(G|y_B, R, q) = 0$$

$$\Pr(G|y_G, IND, q) = \lambda$$

Plugging the respective Bayesian probability on first best investment from equation 1, we get optimum investment for each case.

- Remark 1

We saw that first best investment is  $K^F_{GI} = \mu^2$  and  $K^F_{BI} = 0$ , thus comparing with optimum investment on claim 3:

$k(y_B, Le, q^*)$ :

$$\text{Assume } \left[ \frac{\lambda(1-q^*)}{1-\lambda q^*} \right]^2 \mu^2 < \mu^2$$

$$\text{Thus, } \left[ \frac{\lambda(1-q^*)}{1-\lambda q^*} \right]^2 < 1 \Rightarrow \frac{\lambda(1-q^*)}{1-\lambda q^*} < 1 \Rightarrow \lambda(1-q^*) < 1-\lambda q^* \Rightarrow \lambda - \lambda q^* < 1 - \lambda q^* \Rightarrow$$

$$\lambda < 1$$

This is true by definition

$k(y_G, R, q^*)$ :

$$\text{Assume } \left[ \frac{\lambda}{1-(1-\lambda)q^*} \right]^2 \mu^2 < \mu^2$$

$$\text{Thus, } \left[ \frac{\lambda}{1-(1-\lambda)q^*} \right]^2 < 1 \Rightarrow \frac{\lambda}{1-(1-\lambda)q^*} < 1 \Rightarrow \lambda < 1 - (1-\lambda)q^* \Rightarrow (1-\lambda)q^* < (1-\lambda) \Rightarrow q < 1$$

This is true by definition

- Claim 4

By the assumption of competitive market, the price of the firm equals investors' expected return  $p^2 \mu^2$  plus the expected damage award from overstatement

Thus, plugging the respective Bayesian probability summarized on proof of Claim 3 we have:

$M(y_G, Le, q^*)$ :

$$\Pr(G|y_G, Le, q) = 1 \text{ and expected liability} = 0$$

$$E[M(y_G, Le, q^*)] = \mu^2$$

$M(y_B, Le, q^*) :$

$$\Pr(G|y_B, Le, q) = \left[ \frac{\lambda(1-q)}{1-\lambda q} \right]^2$$

The Bayesian probability to receive a liability when a conservative manager releases  $Y_B$  is  $\frac{(1-q^*)\lambda}{1-\lambda q^*}$

$$\text{Thus, } E[M(y_B, Le, q^*)] = \left[ \frac{\lambda(1-q^*)}{1-\lambda q^*} \right]^2 \mu^2 + \frac{(1-q^*)\lambda}{1-\lambda q^*} L$$

$M(y_G, R, q^*) :$

$$\Pr(G|y_G, R, q) = \frac{\lambda}{1 - (1-\lambda)q}$$

The Bayesian probability to receive a liability when a conservative manager release

$Y_G$  is  $\frac{(1-\lambda)(1-q^*)}{1-(1-\lambda)q^*}$

$$\text{Thus, } E[M(y_G, R, q^*)] = \frac{\lambda}{1-(1-\lambda)q^*} \mu^2 + \frac{(1-\lambda)(1-q^*)}{1-(1-\lambda)q^*} L$$

$M(y_B, R, q^*) :$

$$\Pr(G|y_B, R, q) = 0$$

Thus,

$$E[M(y_B, R, q^*)] = 0 \cdot \text{Claim 5}$$

Proof follows proof of Claim 1

- Proposition 1

From figure 3 we can see that manager turns from Rigorous to Lenient when  $\frac{\Delta M}{L} = \Delta \lambda$

From figure 4 we can see that manager turns from Rigorous to Lenient when  $\frac{\Delta M}{L} = \frac{\Delta \lambda}{1-\lambda}$

Because by definition  $\lambda$  is greater than zero,  $\Delta M_{-L}$  increases managers' rigorousness and reduces leniency when impairment loss reversals are allowed • Corollary 3

Straightforward from Proposition 1

- Claim 6

Follows proof of Claim 2

- Lemma 2

Follows proof of Lemma 1 • Proposition 2

Straightforward from Lemma 1 and Lemma 2

- Claim 7

When allowed to reverse impairment losses, Bayesian probabilities summarize as follows:

$$\Pr(G|y_G, Le, q) = 1$$

$$\Pr(G|y_B, Le, q, Re) = \frac{1-q}{1-q\lambda}$$

$$\Pr(G|y_G, R, q) = \frac{\lambda}{1-(1-\lambda)q}$$

$$\Pr(G|y_B, R, q, Re) = 0 \Pr(G|y_G, IND, q) = \lambda$$

The rest of this proof follows the proof of Claim 3

- Remark 2

Follows proof of Remark 1

- Lemma 3

Assume  $q^*_{NR}$  as optimum effort for Non-Reversal accounting and  $q^*_R$  for Reversal accounting.

We know from proposition 2 that  $q^*_{NR, Ri} > q_{R, Ri}^*$

$$(1 - q^*_{R, Ri}) > (1 - q_{NR, Ri}^*) > \lambda(1 - q_{NR, Ri}^*) \Rightarrow (1 - q_{R, Ri}^*) > \lambda(1 - q_{NR, Ri}^*)$$

Thus,  $\frac{1-q^*}{1-q^*\lambda} > \frac{\lambda(1-q^*)}{1-q^*\lambda}$

Hence,  $\mu^2 - \left[\frac{1-q^*}{1-q^*\lambda}\right]^2 \mu^2 < \mu^2 - \left[\frac{\lambda(1-q^*)}{1-q^*\lambda}\right]^2 \mu^2$

- Claim 8

Follows proof of Claim 4

- Lemma 4

Straightforward from Claims 4 and 8

- Proposition 3

Straightforward from Claims 4 and 8 and Lemma 3

- Claim 9

After manager reverse impairment losses, Bayesian probabilities summarize as follows:

$$\Pr(G|y_G, Le, q) = 1$$

$$\Pr(G|y_B, Le, q, Re) = 0$$

$$\Pr(G|y_G, R, q) = \frac{\lambda}{1-(1-\lambda)q}$$

$$\Pr(G|y_B, R, q, Re) = 0$$

$$\Pr(G|y_G, IND, q) = \lambda$$

The rest of the proof follows the proof of Claims 3 and 4