The role of covenants in public and private debt

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Abstract

Covenants are particular clauses in debt contracts of firms that restrict business policy, giving creditors the possibility of putting precise actions into force – normally early repayment – when the covenants are violated. We refer to the Agency Theory of Covenant (ATC), which assumes that as long as the offsetting benefits exceeds the costs of the constraints imposed by the covenants, the lender will include covenants in their debt contracts. The goal of this paper is to provide a theoretical model that explains the empirical findings of research on public (bonds) and private (bank loans) debt, by highlighting the role of coordination costs among debtholders. Our study introduces two innovative aspects to the existing literature: (1) an emphasis on the covenant violation costs, and (2) the formalisation of a market equilibrium approach. In particular, we formalise the renegotiation costs of the lender, and we identify the effect of the degree of coordination on the renegotiation costs and, ultimately, on the efficiencies in the use of covenants. With regard to, the second point, as far as we know, our paper is the first to present an equilibrium market model for two types of debt contracts with covenant. For the first type, we consider a firm issuing a bond with covenant in the primary market, whereas in the second the firm borrows a syndicated bank loan with covenant. In both models we (1) find that there is a minimum coordination level which guarantees the covenant efficiency, and we (2) identify the optimal covenant threshold.

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1. Introduction

Covenants are particular clauses in debt contracts of firms that restrict business policy, giving creditors the possibility of putting precise actions into force – normally early repayment – when the covenants are violated. The main reason for the existence of bond covenants is to solve the conflicts of interest between shareholders and bondholders. In fact, shareholders and bondholders, having different rights on the cash flows generated by the firm, often suffer because of conflict of interest situations. The shareholders can make business policies that reduce the debt market value, determining a transfer of wealth from the bondholders. In addition, the choice of risky investments gives rise to conflict between the two subjects, because the additional risk will be distributed in an asymmetric way, not favouring bondholders. Covenants, therefore, limiting such behaviour, can reduce the conflict of interest between the two parties. Conversely, covenants produce undesirable effects, thus reducing flexibility in business policy. The type of covenant and its limits must be chosen, therefore, as a way to avoid compromising business policy, as well as showing credibility to the bondholders by reducing the conflict of interests.

Academic research on covenants was carried out in the 70s with a special focus on bonds’ covenants. In the years following these publications, we see a consolidation of this topic with some analysis of banking issues. In the last few years two important study areas have been looked at in detail: (1) the problems relating to violation of covenants and (2) the differences between covenants for public debt and those for private debt. Regarding the former area, most of the literature addresses various aspects of ac-

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1 Smith and Warner (1979) can be said to be the pioneers providing a detailed analysis of the different types of covenants in public debt issues and the types of stockholder–bondholder conflicts that these covenants are designed to mitigate.

2 In Jensen and Meckling (1976) the covenant instrument was related to the agency costs theory. Black and Cox (1976), using the bond model proposed by Merton (1974), published the first article on the price of covenants. Myers (1977) included the covenants in the more general theory of business indebtedness and, finally, Smith and Warner (1979) developed a solid theoretical framework for covenants.

3 Such as the analysis of the bank’s monitoring activities (Berlin and Loeys, 1988; Park, 2000) and several empirical works (Kalay, 1982; Malitz, 1986).
counting, except for some articles related to the renegotiation of the debt contract as a result of covenants violation. The main focus of the articles related to the latter study area are the differences within bond covenants in typical banking topics, such as: banking relationships, the role of collaterals and monitoring.

With regard to the empirical studies of covenants, a large part of them have tried to test the debt covenant hypothesis proposed by Smith and Warner (1979), i.e. firms choose accounting methods to maximize slack in debt covenant constraints. In particular, Smith (1993) and Sweeney (1994) have noticed a different attitude in covenant violation by banks and bondholders. Private debt covenants are usually set tighter than public debt covenants. This results in a greater likelihood of covenant violations in private debt, as opposed to public debt. Both authors hypothesize that this difference is mainly due to the different degree of coordination of the two classes of creditors. Indeed, in the case of private debt, the number of creditors is limited and are mainly banks. In the case of public debt, the number of creditors is significantly higher and made up mainly of non-institutional investors, resulting in greater difficulty in finding shared agreement in case of violation. This implies, therefore a higher total violation cost. So, despite the fact that covenants are effective in reducing the conflict of interest between shareholders and bondholders, the efficiency of the instrument is reduced in the case of public debt. Some empirical works have documented these differences by comparing public and private debt contracts in terms of number, variety and restrictiveness of covenants. Some authors proposed the creation of a “super-trustee” acting

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5 Berlin and Mester (1992); Chava and Roberts (2008); Gärlénau and Zwiebel (2008),

6 Citron, Robbie and Wright (1997), Cotter (1998); Mather (1999); Carletti (2004); Mather and Peirson (2006); Demiroglu and James (2009).

7 Rajan and Winton (1995); Black, Carnes, Mosebach and Moyer (2004); Carletti (2004).

8 Booth and Chua (1995); Dichev and Skinner (2002); Niskanen and Niskanen (2004); Asquith, Weber and Beatty (2005); Paglia and Mullineaux (2006).

9 Whittred and Zimmer (1986); Stokes and Tay (1988); Cotter (1998); Mather (1999); Mather and Peirson (2006).
on behalf of the bondholders in order to increase efficiency in bond covenants, where the bondholders might have a low level of coordination\(^{10}\).

The goal of this paper is to provide a theoretical model that explains the empirical findings of those works highlighting the role of coordination costs among debtholders in public and in private debt.

The theoretical framework of this study refers to the Agency Theory of Covenant (ATC), first postulated by Jensen and Meckling (1976) and then extended by Myers (1977) and Smith and Warner (1979). This theory assumes that as long as the offsetting benefits exceeds the costs of the constraints imposed by the covenants, the lender will include covenants in their debt contracts. According to Smith and Warner (1979), the benefits consist of the reduction in agency costs, which translates into lower financing costs. The decision to include a covenant and to define its features are therefore decided simultaneously with the pricing of the debt. The result is a negative relation between the spread on the debt with covenant and the tightness of the covenant (Bradley and Roberts, 2004). Coherent to this theory, our study is based on the assumption that the inclusion and the design of an optimal set of financial covenants in the debt contract are the result of a revenues-costs trade-off, both for the lender and for the borrower. Most of the literature has empirically tested the ATC, by estimating the pricing impact of including various covenants on the cost of debt\(^{11}\). From a theoretical perspective, some authors have analysed the pricing of debt covenants, focusing on the design and the renegotiation under asymmetric information (Gårlenau and Zwiebel, 2008). Bradley and Roberts (2004) have defined a simultaneous estimation model in order to be able to distinguish between spread on bank loans with covenants and standard loans. In common with their pricing model, our study stems from a costs-benefits trade-off approach. More precisely, our study investigates the optimum covenant choice, expressed in terms of its tightness by applying, both for the lender and for the borrower, a maximization of the net benefits following the inclusion of the covenant. In defining costs and benefits of the covenant inclusion, we differ from existing models by formally introducing further elements, such as the probability of covenant violation and

\(^{10}\) Amihud, Garbade and Kahan (2000).

\(^{11}\) Booth and Chua (1995); Cotter (1998); Dichev and Skinner (2002); Bradley and Roberts (2004); Chava et al. (2005); Niskanen and Niskanen (2004); Asquith, Weber and Beatty (2005); Moir and Sudarsanam (2007).
the specification of the different costs arising should the covenant violation occur and costs existing during the whole period of the covenant.

Our study introduces two innovative aspects to the existing literature: (1) an emphasis on the covenant violation costs, and (2) the formalisation of a market equilibrium approach, in the case of the issue of both public debt with covenant and private debt with covenant. With regard to the first aspect, we refer to the analysis conducted by Beneish and Press (1993) in which the authors classify three types of violation costs. In particular, we formalise the renegotiation costs that the lender must pay in such a case, and we identify the effect of the degree of coordination on the renegotiation costs (between bondholders in public debt contract, and between banks in private debt contract) and, ultimately, on the efficiencies in the use of covenants. The lack of coordination between the debtholders may in fact reduce the efficiency due to the high amount of expected renegotiation costs following the covenant violation. The empirical evidence shows that in situations where there are syndicated bank loans and a high degree of coordination, these costs are lower and the use of covenants is more efficient. Regarding the second aspect, as far as we know, our paper is the first to present an equilibrium market model for two types of debt contracts with covenant. For the first type, we consider a firm issuing a bond with covenant in the primary market, whereas in the second the firm borrows a syndicated bank loan with covenant. The two contract models will emphasize the role played by the different level of coordination existing among bondholders and among banks.

The remainder of the article is organized as follows. In Section 2 we highlight revenues and costs in covenant contracts, respectively for the firm, the bondholders and the bank. In Section 3 we define the firm-bondholders and the bank-firm theoretical models. In Section 4 we analytically illustrate the models’ function, both in the case of the issuing of a covenant bond, and of a loan with covenant. In Section 5 we conclude and indicate further research.

2. Revenues and costs in covenant contracts

The conflict between shareholders and debtholders, and the role of covenants, has been classified in an organic way by Smith and Warner (1979). Under certain assumptions about the firm’s structure, of which the most important is the lack of agency costs on all other types of contracts, the two authors identify three main sources of conflict: (1) dividend payments, (2) claim dilution and (3) assets substitution. A fourth cause, identified by Myers (1977), deals with (4) underinvestment. The presence of these con-
flicts influences bond issuing, since the price of the bond embodies the firm’s policies. In fact, the debt issued by a company has a financial component and a structural component. The first is subject to financial risk, because the price of debt is changed according to the variation in the interest rate. The second component is subject to business risk, estimated according to the variability of the assets value. The cash flows to the debtholders usually do not depend on the second component, so any change in the business risk associated to the bond issue entails a corresponding change in its market price. In addition to this reasoning, the conflict of interests also depends on the different nature of the rights to the cash flows of the two groups of subjects. Shareholders receive the residual cash flow, after having paid the bondholders who are entitled to fixed cash flows. The limited liability of the shareholders to the net capital, together with bankruptcy costs, can also change the risk preferences of shareholders and debtholders (see Damodaran, 2001).

The conflict of interest between shareholders and bondholders can be reduced by including appropriate covenants in debt contracts in an attempt to influence a firm’s policies and to reduce the transfer of wealth to shareholders. In assessing the efficiency of the covenant in mitigating these conflicts of interest, the inter-relatedness between activities that covenants restrict have to be considered. A limitation on dividend payments, for example by setting dividends equal to a fixed fraction of net income, indirectly affects investment decisions, because it may preclude the firm from distributing cash to shareholders that otherwise would have been used to finance investments (Myers, 1977; Kalay, 1982). Covenants that limit a company’s ability to issue more senior debt or, more generally, further debt are designed to protect the bondholders from the dilutive effect on cash flow rights. Moreover, covenants on overall borrowing indirectly reduce the over-investment attitude of the firm: by limiting the firm’s financing decision, the bondholders are also protected by the substitution of the firm’s existing assets with riskier ones (Leland, 1994). Similarly, restrictions on mergers and asset sales are often a means of mitigating the asset substitution or over-investment problem (Jensen and Meckling, 1976). Covenants are often designed to prevent the so-called underinvestment issue. Dividends or leverage restriction, increasing seniority on new debt are actions that should minimize this problem: by limiting the freedom to spend the company’s free cash flow the management is in some sense forced to invest, or to build up reserves (Mayers and Smith, 1987; Berkovitch, 1990; Garven and MacMinn, 1993).

However, using covenants involves certain costs, both for the firm including these limiting clauses in the debt contracts, and for the debtholders that subscribe a debt covenant instrument. Covenants are costly for the firm because they restrict future
financing and investment decisions. Firms with high growth opportunities prefer to have few restrictive covenants, given that they have to preserve future financing and investment flexibility. Conversely, restrictive covenants may be more bearable for firms with low growth opportunities (Beatty et al., 2002; Billet et al., 2007). At the same time restrictions on flexibility are compensated by the lower interest rate that the firm pays to the bondholders, as compared to an equivalent bond without covenants (Smith and Warner, 1979). A second type of cost are the violation costs. In fact, if the company violates the covenants, the creditor may normally require early repayment or its renegotiation. In both cases the company and the creditors must bear a number of costs, which can reduce the efficiency of covenants. We can consider three types of violation costs: (1) renegotiation costs, (2) refinancing costs, and (3) restructuring costs (Beneish and Press, 1993). The first are related to the time spent by the manager for negotiation and for the redefinition of the debt contract: these costs typically include fees for attorneys, accountants and auditing. The costs of refinancing consist of the higher interest rate on the new issued debt following the covenant’s violation (either in the case of a new debt contract or of a redefinition of the existing ones). Finally, the restructuring costs are associated with company policy changes after the violation (for example, the request for reduction of financial leverage or the decrease in business performance due to liquidation of assets). The refinancing and renegotiation costs are mainly paid by the debtor, whereas the costs of the renegotiation are usually charged to the lender.

Since the decision to include a covenant in a debt contract is costly, the lender’s benefits must, in equilibrium, at least equal the costs.

2.1. Costs and revenues of the firm

When a firm issues a bond covenant or takes out a bank loan with covenant the main benefit is the decreasing borrowing costs. As a matter of fact, as argued by Smith and Warner (1979) firms optimally trade off restriction costs imposed by covenants with the lower cost of debt due to reduced agency risk. The spread on the bond covenants will be lower than that on the standard bond, since the covenant reduces managerial or shareholders’ ability to take actions detrimental to the bondholders. In return for those agreed constraints on the company’s activities, which represent a protection for the debtholders, the firm thus obtains a lower spread on the debt. This negative relationship between bond covenants and the cost of debt is the most important consequence of the so called agency cost view of the firm (Jensen and Meckling, 1976; Myers, 1977).
At the same time, having to respect the covenant forces the firm to comply with specific restrictions, such as investment decisions, dividend policy and leverage ratio, which may substantially reduce the firm’s growth and strategy opportunities. The costs of these flexibility constraints are mainly a function of the tightness of the covenants: the closer the firm’s current position relative to the threshold imposed by the covenant, the higher are the costs incurred in order to respect the covenant (Beatty et al., 2002). At the same time, the magnitude of these flexibility costs depends on the level of growth opportunities of the firm. On the one hand, firms with high growth opportunities are more likely to suffer from stockholder–bondholder conflicts and they would therefore benefit the most from restrictive covenants. On the other hand, these firms may consider it extremely important to preserve future financing and investment flexibility, by agreeing on few restrictive covenants (Nini et al., 2009). On the contrary, firms with low growth opportunities may prefer to have more restrictive covenants (Billet et al., 2007). For the purpose of this paper, we will consider firms with the same level of growth opportunities, thus making the costs of flexibility just dependant on the tightness of the covenant.

With regard to the violation costs of the firm we will refer to the analysis conducted by Beneish and Press (1993), in which the two authors classify three different types of costs resulting from a covenant violation. In this paper, we will hypothesize that the firm bears the refinancing and restructuring costs, whereas the costs of the renegotiation are charged to the bondholders. We also assume that such costs do not depend on the tightness of the covenant.

2.2. Costs and revenues of the bondholders

The covenant enables the bondholders to benefit both in indirect and direct terms. First, the covenants offer a partial solution to the conflict of interest issue: the bondholders have more control over the company’s activities and policies and gain better protection of their rights (Jensen and Meckling, 1976; Smith and Warner, 1979). Second, the bondholders benefit in direct terms from the debt prepayment in the case of covenant violation, as they receive the difference between the nominal and the market value of the bond. The lower the expected market value in the case of covenant violation (which usually corresponds to a low covenant threshold), the higher the benefit from prepayment.

On the other hand, when bondholders accept a bond with a covenant they also accept certain costs. First, they receive lower interest on the bond, as compared to the in-
terest of an equivalent bond without covenants (Smith and Warner, 1979). Secondly, as pointed out in Beneish and Press (1993) they face the renegotiation costs at the time of covenant violation. For the purpose of this paper, we will assume that these renegotiation costs, which refer to the time needed for negotiation and for the redefinition of the debt contract, are fully charged to the debtholders. We hypothesize that renegotiation costs do not depend on the tightness of the covenant. We also assume that the size of these costs is a function of the degree of coordination between the debtholders: it is reasonable, in fact to suppose that the more efficient the debtholders coordination is, the less costly the renegotiation process will be. Consequently, the higher the number of bondholders, the lower the degree of coordination and, therefore the higher the renegotiation costs. Lastly, the bondholders have to continuously perform monitoring activities. As stated by Park (2000), we hypothesize that monitoring activities are delegated to the lender. For the purpose of this paper the bondholders are considered as being of the same rank and therefore we assume that each performs his individual monitoring activities. The costs of monitoring of the single bondholder will be extremely high if the bondholders are not well coordinated. As argued by Jensen and Meckling (1976), the most efficient way to minimize the costs of monitoring consists in delegating monitoring activities to those institutions and individuals who possess comparative advantage in these activities. Therefore a lower average cost of monitoring can only result either from a higher coordination level among bondholders or from the designation of a unique monitoring institution.

2.3. Costs and revenues of the banks

As in the case of the bondholders, a bank first benefits from a loan with covenant in an indirect way: the inclusion of a covenant in the loan contract allows the bank to mitigate the agency costs. In fact, firms may set covenant thresholds to credibly convey to the bank private information concerning their riskiness and future prospects, as pointed out by Gârleanu and Zwiebel (2008) and Demiroglu and James (2009). According to these models, the decision to include a covenant in the debt contract is determined by the private information about the firm’s credit worthiness as well as by its observable credit risk. Therefore, the choice of covenants conveys to the bank significant information about the firm’s expected future performances. With regard to the direct benefits, two types of compensations have to be considered. First, the covenant gives leeway for a lower expected loss ratio. One the one hand, the restrictiveness of the firm’s policies helps in mitigating the overall variability in the market value of the firm’s
activities, thus resulting in a reduction of the firm’s default probability (PD). On the other hand, a reduction in the value of the loss given default (LGD) comes from the inclusion of a covenant in the contract that binds the company in terms of availability of corporate assets. As a consequence, both the reduction in the PD and in the LGD should be reflected in a lower loan pricing: the tighter the covenants the lower the loan interest (Moir and Sudarsanam, 2007). Second, the covenant positively influences the long-term monitoring activities. The bank may in fact include some covenants in the contract, calculated according to the financial ratio used for the estimation of the PD, in order to ask for a repayment or a spread change of the outstanding debt, at the covenant violation. As pointed out by Rajan and Winton (1995), the inclusion of covenants in long-term operations actually increases the flexibility of bank decisions, which can use the information more efficiently, leading to more effective monitoring. Besides these, additional benefits for the bank consists in the higher spread on the new loan, that can be negotiated after the covenant violation. The less restrictive the covenant, the higher is the increase of the new spread in the case of covenant violation. As a matter of fact, the higher the distance from the covenant threshold, the lower is, other things equal, the probability of covenant violation. Therefore, in the less probable case of covenant violation it is reasonable that the bank would charge a higher interest on the new loan, than in the case of violation of a more restrictive, and therefore more likely to be violated, covenant.

Three types of costs derive from the inclusion of a covenant on the loan contract. First, a reduction in the interest rate paid by the firm, given the imposed covenant restriction. Second, the violation costs, mainly represented by the renegotiation costs. As in the case of the bondholders, we will refer to the Beneish and Press (1993) study and we assume that the renegotiation costs are fully charged to the lender, i.e. the bank. Given that relatively few banks are involved in private debt contracts, the degree of coordination could be significantly improved and therefore the renegotiation costs can be efficiently reduced. Third, the banks have to face monitoring costs, which depend, as for the bondholders, on the coordination level of the total lenders. As a matter of fact, banks can benefit from economies of scale in obtaining information about borrowers (Stiglitz and Weiss, 1981; Diamond, 1984; Ramakrishnan and Thakor, 1984).
3. The model

3.1. The firm-bondholders model

In the case of a public debt contract we build two revenue-cost models, one for the firm and a separate one for the bondholders.

We suppose that a firm should issue a bond with nominal value \( D \) and must choose between a standard contract with spread \( s \), and a contract with a financial covenant with the reduction \( b \) on the spread. We define \( d \), the relative distance between the current value of the financial ratio of the firm and the “threshold” value of the ratio as set by the covenant, and the probability of covenant violation, \( p_F \) as estimated by the firm. Let \( F_c \) be the costs arising from the loss of flexibility in corporate policy and \( C_F \) the total violation costs, accounting for both the restructuring and the refinancing costs. Both types of costs are expressed in monetary value. For simplicity let us assume risk neutrality by the firm, so we can only take into account the expected values of the problem. The firm will choose the issue with covenants only if:

\[
D \times s \geq D \times (s - b) + F_c(d) + p_F(d) \times C_F
\]  

(1)

If we divide both terms by the face value of the bond (\( D \)), we get:

\[
b \geq f_c(d) + p_F(d) \times c_F
\]  

(2)

Both the costs of flexibility loss and the probability of violation decrease in respect to \( d \), i.e.

\[
\frac{\partial f_c(d)}{\partial d} \leq 0, \quad \frac{\partial p_F(d)}{\partial d} \leq 0
\]  

(3)

The extreme value of the violation probability when the parameter \( d \) is equal respectively to 0 and 1 is the following:

\[
p_F(0) = 1; \quad p_F(1) = 0
\]  

(4)

The choice set for the firm is included in the following:

\[
\Omega_F = \left\{ (b, d) \mid b - f_c(d) - p_F(d) \times c_F \geq 0 \right\}
\]  

(5)

As defined by the expression (5), the firm decides to issue a bond covenant only if the combination of the spread reduction (\( b \)) and the distance to the covenant threshold (\( d \)) are such that the benefits from financing costs are higher than the total costs. Given that both the costs and the revenues (the spread reduction) are negatively related to \( d \), the firm has to balance a trade-off. The firm’s objective function to maximize is there-
fore the expression (5), subject to the bondholders constraints, as described in the follow-

With regard to the second model, the bondholders are subject to the reduction of the
spread $b$ and to the renegotiation costs in the event of the violation of the covenant $C_{BO}$,
the latter negatively depending on the coordination level of the bondholders as a whole.
Another cost is related to the monitoring of the firm $M_{BO}$, depending also on the bond-
holders coordination level. We set the level of coordination as a function of parameter
$\alpha$, which ranges from 0, in the case of maximum coordination level of the bondholders,
to 1 in the case of minimum level. At the same time, the bondholders benefit from reve-

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In our model the asymmetric information between borrower and lender is reflected in their different estimation of the probability of covenant violation. As a matter of fact, the firm estimates $p_F$, which differs from the bondholders’ calculation, $p_{BO}$. We assume that the firm is able to work out the bondholders’ estimated probability, thanks to some information disclosure in the market (such as the organization of investor road-shows, or the decision to publish a solicited rating on specific investment projects or on the firm in general), which allows both the bondholders to complete their partial information, and the firm to control and build up the information flow. This assumption mitigates the asymmetric information issue, thus amplifying the covenant efficiency.

Therefore, the bondholders will underwrite the bond issue only if:

$$D \times s \leq \left[ s - b \right] - p_{BO} \left( d \right) \times C_{BO} \left( \alpha \right) - M_{BO} \left( \alpha \right) + p_{BO} \left( d \right) \times R_{BO} \left( d \right)$$

(6)

If we divide both terms by the face value of the bond ($D$), the expression (6) can be
simplified as follows:

$$b \leq p_{BO} \left( d \right) \times \left[ \left[ r_{BO} \left( d \right) - c_{BO} \left( \alpha \right) \right] - m_{BO} \left( \alpha \right) \right]$$

(7)

As in the previous case the probability of violation, as estimated by the bondholders,
decreases in respect to $d$, while revenues from the early repayment are supposedly
growing. Indeed, the greater the distance set at the time of the issue, the greater the re-
duction in the market price in the event of violation. Moreover, both the violation and
the monitoring costs increase with respect to $\alpha$. The signs of the derivatives are, in this
case, the following:
As in the firm’s model, since all terms are within the interval \([0,1]\) their extreme values when the parameters \(d\) and \(\alpha\) are respectively equal to 0 and 1 are the following:

\[
P_{BO}^0(0) = 1; \quad P_{BO}^1(1) = 0; \quad r^0(0) = 0; \quad r^1(0) = 0.
\]  

\[
\Omega_{BO} = \{ (b,d) \mid b - P_{BO}(d)[r_{BO}(d) - c_{BO}(\alpha)] + m_{BO}(\alpha) \leq 0 \} \tag{10}
\]

As defined by the expression (10), the bondholders agree to subscribe to a bond covenant only if the combination of the spread reduction \((b)\) and the distance to the covenant threshold \((d)\) are such that the total costs (the lower interest, monitoring and renegotiating costs) are lower than the revenues associated to the reduction in the market price in the event of covenant violation, which are equal to the difference between the reimbursed nominal value and the current market value.

Given such models, the firm has to maximize the expected revenues, subject to the bondholders’ function constraints, whose total costs are dependent on \(\alpha\):

\[
\max_{(b,d) \in \Omega_F} b - f_{\alpha}(d) \times p_{\alpha}(d) \quad \text{s.t.} \quad (b,d) \in \Omega_{BO} \tag{11}
\]

The F.O.C for an internal solution are the following:

\[
\frac{\partial p_{BO}(d)}{\partial d} \left[ r_{BO}(d) - c_{BO}(\alpha) \right] + p_{BO}(d) \frac{\partial r_{BO}(d)}{\partial d} - \frac{\partial f_{\alpha}(d)}{\partial d} - \frac{\partial p_{\alpha}(d)}{\partial d} c_{\alpha} = 0 \tag{12}
\]

Given the signs of the derivatives, the necessary condition for the existence of a solution in the expression (12) is that the costs of renegotiation are lower than the revenues from early repayment in case of covenant violation, which is expressed as follows:

\[
r_{BO}(d) - c_{BO}(\alpha) \leq 0 \tag{13}
\]

Given the benefits occurring from the prepayment in case of covenant violation, which depend on the settled parameter \(d\), the equation (13) holds as long as the level of coordination among debtholders guarantees that any eventual renegotiation costs would be lower than the expected benefits. Conversely, given a specific level of debtholders’ coordination the equation (13) holds if the covenant is set at a threshold sufficient to ensure that the consequent benefits offset the corresponding costs. As expressed in (8), a low level of coordination between the bondholders increases renegotiation costs (parameter \(\alpha\) increases). Other things being equal, the bond will be issued with a higher value of \(d\). If the coordination level is extremely low, the firm could con-
sider it more convenient to issue a standard bond. In the latter case both the firm and the bondholders face an inefficient condition, with respect to the issue of a covenant bond. In fact, by issuing standard bonds the firm bears a higher cost of borrowing, whereas the bondholders do not benefit from the mitigation of the agency problems. Moreover, a situation could occur where the bondholders are not at all willing to underwrite such bonds, although they would be more remunerative, given the high associated expected agency costs. Therefore, only a high level of coordination, for example if the bondholders decided to rely on a trustee, would lead to a reduction in the expected renegotiation costs in the event of covenant violation and, consequently, would make the choice of issuing bonds with covenant an efficient one.

If we define the expression (12) as $L(d)$, the sufficient condition for the existence of an internal solution is the following:

$$L(0) \times L(1) \leq 0$$

(14) is true if:

$$\frac{\partial p_{BO}}{\partial d} \left[ r_{BO}(1) - c_{BO}(\alpha) \right] \leq \left[ \frac{\partial f_{BO}(d)}{\partial d} + \frac{\partial p_{F}(d)}{\partial d} \right]$$

(15)

An internal solution for the firm’s maximization problem, as expressed in (11), occurs if the expected net marginal revenues for the bondholders are lower than the expected total marginal costs for the firm.

3.2. The bank-firm model

In the case of private debt contract we define a revenues-cost model for the bank and one for the firm.

With regard to the first model, we specifically refer to a loan extended jointly by a group of banks to the firm. Each bank will include a financial covenant in a debt contract if the incurred costs are lower than the expected revenues. Suppose that a bank should decide for a loan with nominal value $D$ and must choose between a standard debt contract with spread $s$, and a debt contract with a financial covenant with a reduction $b$ on the spread. As in the case of the private contract, we define the relative distance $d$ between the current value of the financial ratio of the firm and the threshold value of the ratio as set by the covenant. We define with $p_{B}$ the probability of covenant violations, as estimated by the bank. The bank is subject to the reduction of the spread $b$, to the renegotiation costs in the event of violation $C_{B}$ and to the monitoring costs of
the firm $M_B$, the latter of which negatively depend on the coordination level of the banks participating in the syndicated loan. We set the level of coordination as a function of a parameter $\alpha$, which ranges from 0, in the case of a maximum coordination level of the banks, to 1, in the case of a minimum level. At the same time, the bank benefits first from a reduction in the expected loss ratio of the loan: given that the covenant is assumed to reduce both the PD and the LGD of the borrower, the expected loss associated to the debt covenant contract, $EL_C$, is lower than that estimated on a standard loan contract, $EL_T$. The reduction in the expected loss $\Delta EL$ is positively related to $d$: the higher the distance to the threshold of the covenant, the lower is the expected loss of the debt incurred with covenant $EL_C$ with respect to the loss associated with the standard debt $EL_T$, thus increasing $\Delta EL$. Second, the bank benefits from revenues in terms of the higher spread on the new debt $R_B$ because, when the firm violates the covenant, with probability $p_B$ as estimated by the bank, the new price of the loan will be higher, thus reflecting the implicit greater risk. The increase in the new spread is positively related to $d$. As in the previous model, let us, for simplicity assume risk neutrality by the bank, so we can only take into account the expected values of the problem. The bank will therefore include a covenant in the debt contract only if:

$$D \times s - EL_T \leq D \times (s - b) - EL_C + p_B \times \left[ R_B - C_B \right] - M_B \alpha$$  (15)

If we divide both terms by the face value of the bond ($D$), after some simplification we get:

$$b - \Delta el(d) - p_B \times \left[ R_B - C_B \right] + m_B \alpha \leq 0$$  (15)

The probability of violation decreases in respect to $d$. Conversely, the expected loss reduction and the increase of the new spread increase in respect to $d$. The violation and the monitoring costs increase with respect to $\alpha$. The signs of the derivatives are the following:

$$\frac{\partial p_B}{\partial d} \leq 0, \quad \frac{\partial \Delta el(d)}{\partial d} \geq 0, \quad \frac{\partial R_B}{\partial d} \geq 0, \quad \frac{\partial C_B}{\partial \alpha} \geq 0, \quad \frac{\partial m_B}{\partial \alpha} \geq 0$$  (16)

Since all terms are within the interval [0,1] their extreme values when the parameters $d$ and $\alpha$ are equal respectively to 0 and 1 are the following:

$$p_B(0) = 1; \quad p_B(1) = 0; \quad r_B(0) = 0; \quad \Delta el(0) = 0$$  (16)

The choice set for the bank is the following

$$\Omega_B = \left\{ (b,d) | b - \Delta el(d) - p_B \times \left[ R_B - C_B \right] + m_B \alpha \leq 0 \right\}$$  (17)
As defined by the expression (17), the bank decides to include a covenant in the loan contract only if the combination of the spread reduction \(b\) and the distance to the covenant threshold \(d\) are such that the benefits from the reduced expected loss and the higher spread in the case of covenant violation are higher than total costs. The bank’s objective function to minimize is therefore the expression (17), subject to the firm constraints, as described in the following.

The firm will accept a debt contract with covenant if the costs arising from the loss of flexibility in corporate policy \(F_c\) and the total restructuring and refinancing costs \(C_F\), both expressed in monetary value, are lower than the benefits from the reduction in the debt spread \(b\). For simplicity let us assume risk neutrality by the firm, so we can only take into account the expected values of the problem. The firm will choose the loan with covenants only if:

\[
b - f_c (d) - p_b (d) \times c_F \geq 0
\] (18)

Because in this model the tightness of the covenant is set by the bank, the firm constraint is based on the probability of covenant violation as estimated by the banks. In this model the asymmetric information between lender and borrower is reduced or even eliminated, thanks to the long-term lending relationship between the bank and the firm. As in the previous model, both the costs of flexibility loss and the probability of violation decrease in respect to \(d\), i.e.

\[
\frac{\partial f_c (d)}{\partial d} \leq 0, \quad \frac{\partial p_b (d)}{\partial d} \leq 0
\] (19)

As in the previous model, the extreme values of the probability of violation when the parameter \(d\) is equal respectively to 0 and 1 is the following:

\[
p_b (0) = 1; \quad p_b (1) = 0
\] (20)

The choice set for the firm is included in the following:

\[
\Omega_F = \left\{ (b, d) \left| b - f_c (d) - p_b (d) \times c_F \geq 0 \right. \right\}
\] (21)

As in the previous model, the firm accepts a covenant loan only if the combination of the spread reduction \(b\) and the distance to the covenant threshold \(d\) are such that the benefits from borrowing costs are higher than the total costs. Given that both the costs and the revenues (the spread reduction) are negatively related to \(d\), the firm has to balance a trade off.

Given such models, the bank has to minimize the expected net costs, subject to the firm function constraints, in which the probability of covenant violation is estimated by the bank:
\[ \min_{(b,d) \in \Omega_b} b - \Delta e l(d) + p_b(d) \times \left[ c_b(\alpha) - r_b(d) \right] + m_b(\alpha) \text{ s.t. } (b,d) \in \Omega_b \] \quad (22)

The F.O.C for an internal solution is the following:

\[ \frac{\partial p_b(d)}{\partial d} \left[ c_F + c_b(\alpha) - r_b(d) \right] - \frac{\partial \Delta e l(d)}{\partial d} + \frac{\partial f_b(d)}{\partial d} = 0 \] \quad (23)

Given the signs of the derivatives, the necessary condition for the existence of a solution in the expression (23) is that the costs of renegotiation and flexibility are lower than the revenues from the higher spread on the new issued debt in case of covenant violation, which is:

\[ c_F + c_b(\alpha) - r_b(d) \leq 0 \] \quad (24)

Given the benefits occurring from the higher spread that the bank will charge on the new loan in case of the covenant violation, which depend on the settled parameter \( d \), the equation (24) holds as long as these benefits \( r_b \) are higher than the sum of the restructuring and refinancing costs \( C_F \) of the firm and the renegotiation costs of the bank. Whereas the firm’s violation costs are fixed, the renegotiation costs of the bank, should covenant violation occur, depend on the degree of lenders’ coordination, that are, in this model, the group of banks providing funds to the firm. In other words, given the firm’s violation costs, the equation (24) is valid if the banks’ coordination level enables the corresponding renegotiation costs to be lower than the difference between the expected benefits of the bank in the case of covenant violation and the firm’s violation costs. Conversely, given a specific level of bank coordination the equation (24) holds if the covenant is set at a threshold sufficient to ensure that the consequent benefits for the bank offset the sum of the violation costs of both the firm and the banks. As expressed in (16), a low level of coordination between the banks increases the renegotiation costs (parameter \( \alpha \) increases). Other things being equal, the covenant loan contract will include a higher value of \( d \), which corresponds to a higher expected revenue in the case of covenant violation. If the coordination level is extremely low, the banks could consider it more convenient to issue a standard loan. In this latter case both the firm and the bank suffer from an inefficient debt contract, with respect to the loan covenant. In fact, by taking out a standard loan the firm bears a higher financing cost, whereas the banks do not benefit either from the lower expected losses or from the mitigation of the agency problems. Moreover, the banks might not be willing to fund the firm at all, despite the higher loan interest, given the high expected agency costs associated with it. Therefore, only a higher level of coordination among banks (for example through a lead manager) would lead to a reduction in the expected renegotiation costs in the event of
covenant violation and, consequently, would make the choice of lending with covenant the better option.

If we define the expression (23) as \( L(d) \), the sufficient condition for the existence of an internal solution is the following:

\[
L(0) \times L(1) \neq 0 \quad (25)
\]

The (25) is true if:

\[
\frac{\partial p_B(d)}{\partial d} c_f + \frac{\partial f_c(d)}{\partial d} \geq \frac{\partial \Delta d(d)}{\partial d} + \frac{\partial p_B(d)}{\partial d} \left[ r_B (1) - c_B (\alpha) \right] \quad (26)
\]

An internal solution for the firm’s maximization problem, as expressed in (26), is feasible if and only if the expected net marginal revenues for the bank are lower than the expected total marginal costs for the firm.

4. An application of the model

In order to analyse the results and the implications of the two models proposed in the previous paragraph, we need to analytically define the objective function of both the firm, in the case of the issue of covenant bond, and the bank, in the case of a loan with covenant.

4.1. The firm-bondholder model

We introduce a linear function for each variable included in the firm’s maximization problem, as expressed in the equation (11):

\[
p_{BO} (d) = 1 - d; \quad r_{BO} (d) = \hat{r}_{BO} d; \quad f_c (d) = \varphi (1 - d); \quad p_f (d) = 1 - d
\]

\[
c_{BO} (\alpha) = \hat{c}_{BO} \alpha; \quad m_{BO} (\alpha) = \hat{m}_{BO} \alpha \quad (27)
\]

We assume that all parameters (\( \hat{r}_{BO} , \varphi , \hat{c}_{BO} , \hat{m}_{BO} \)) are positive.

The parameter \( \hat{r}_{BO} \) represents the bond’s risk factor, the riskier the bond (\( \hat{r}_{BO} \) is high), the higher the corresponding expected revenues should the covenant be violated, for each level of covenant threshold. The riskiness of the bond may be included both in some bond’s characteristics (as for example the maturity of the bond) and in the borrower’s credit worthiness. With regard to the former aspects, a positive relation between the inclusion of covenants and the maturity of a loan has been documented in literature (Bradley and Roberts, 2004), thus confirming the role of covenant as an early warning device that allow debtholders to shorten the maturity period of the debt (Di-
chrome and Skinner, 2003). At the same time, other authors observe a negative relation between the maturity of the bond and the number of covenants, thus assuming that borrowers are less willing to include covenants in long-term debt in order to avoid costly restrictions over long time periods (Berlin et al., 2007). With regard to the second feature, some authors show that the restrictiveness of debt covenants decreases according to the credit worthiness of the borrower (Berlin and Mester, 1992).

The parameter $\varphi$ stands for the maturity of the firm: for each covenant threshold level, when the firm is at a mature stage in an industry with slowing growth opportunities ($\varphi$ is low), the flexibility costs associated to the bond covenant are lower than those borne by a young firm with increasing business prospects ($\varphi$ is high). Several studies suggest a negative relation between growth opportunities and the use of financial covenants. Some authors find that high-growth firms are less likely to include restrictive covenants in public debt (Begley, 1994; Kahan and Yermack, 1998; Nash, Netter, and Poulsen, 2003), suggesting that preserving future flexibility is considered more important than reducing the cost of debt by including covenants. Conversely, it has been noted (Myers, 1977; Bradley and Roberts, 2004) that high-growth firms are more likely to include dividend restrictions, in order to control the funds allocation, and at the same time they are less likely to include restrictions that prevent them from obtaining additional funds in the future. Moreover, some studies (Billet et al., 2007) provide evidence that covenant tightness is increasing in growth opportunities, debt maturity, and leverage, thus suggesting that firms use covenants to mitigate stockholder–bondholder conflicts over the exercise of growth options, in spite of the fact that covenants potentially limit future investment and financing flexibility.

The parameter $\hat{c}_{BO}$ reflects the country’s legal framework: among each level of coordination among bondholders, it is seen that when their legal protection is relatively low ($\hat{c}_{BO}$ is high), the relative renegotiation costs in the case of covenant violation tend to be higher. Several research contributions have pointed out that creditors’ protection is limited both by informational asymmetries between debtor and creditors and by the costly creditors’ collective renegotiation process upon covenant violation. Any attempt to reduce the asymmetries by introducing more informative accounting rules, or to mitigate the collective action problem by changing the formal procedures to reach an agreement, may therefore increase creditors’ protection. Schmidt (2006) suggests reducing the quorum for decisions made in assemblies in order to reduce delays in the renegotiation process; Bratton (2006) proposed an amendment to U.S. legislation concerning bondholders’ trustees in order to increase the power of action during the re-
negotiation. The “supertrustee” proposal put forward by Amihud, Garbade and Kahan (2000) includes aims to extend the trustee’s duties in the pre-default phase on the strength of an agreement, including the power to act independently of bondholders according to a business judgment standard (also Schmidt, 2006, and Schwarcz and Sergi, 2008, embrace this solution).

Lastly, the parameter $\hat{m}_{BO}$ is correlated to the individual firm’s characteristics (such as the size, the public or private nature of the firm) that influences the cost of monitoring the firm’s activities depending on the bondholder coordination level.

By substituting the linear expressions of (27) into the firm’s maximization problem, as reported in the expression (11), we get the covenant threshold optimal level, expressed as a function of all parameters, which is:

$$d^* = \frac{1}{2} + \frac{\phi + c_F + \hat{c}_{BO} \alpha}{2\hat{r}_{BO}}$$

Using the equation (28) it can be shown that the covenant tightness changes if the parameters $\phi, \hat{r}_{BO}, \alpha$ modify, according to the following:

$$\frac{\partial d^*}{\partial \hat{r}_{BO}} = -\frac{1}{2} \frac{\hat{c}_{BO} \alpha}{\hat{r}_{BO}^2} \leq 0$$

$$\frac{\partial d^*}{\partial \phi} = \frac{1}{2\hat{r}_{BO}} \geq 0$$

$$\frac{\partial d^*}{\partial \alpha} = \frac{\hat{c}_{BO}}{2\hat{r}_{BO}} \geq 0$$

The expression (29) highlights the fact that if the firm decides to issue a riskier bond, such as a long-maturity bond, the tightness of the covenant has to increase. As a consequence, in order to preserve flexibility the firm has to issue a less risky bond, such as a short-term bond, which allows for less restrictive covenants. If the firm is in the early stage of its life cycle and has increasing growth opportunities the covenant has to be set at a lower threshold, as expressed in (30). With regard to the relationship between the optimal covenant threshold and the level of coordination, the expression (31) shows that as the coordination among the bondholders decreases ($\alpha$ increases), the tightness of the covenant decreases ($d$ increases). Indeed, due to the expectation of high renegotiation costs in the event of covenant violation, which depends on a low and therefore costly level of coordination, the bondholders will only accept a less restrictive covenant bond.
### 4.2. The bank-firm model

As in the previous model, we introduce a linear function for each variable included in the bank’s minimization problem, as expressed in the equation (22).

\[
\begin{align*}
p_B(d) &= 1 - d; & f_c(d) &= \phi(1 - d); & \hat{r}_B = \hat{r}_B d; & \Delta e_l(d) = \mu d \\
c_B(\alpha) &= \hat{c}_B \alpha; & m_B(\alpha) &= \hat{m}_B \alpha
\end{align*}
\]  

(32)

We assume that all the parameters \(\hat{r}_B, \phi, \hat{c}_B, \hat{m}_B, \mu\) are positive. The parameters \(\phi\), which refer to a firm’s growth and flexibility characteristics, has obviously the same meaning as in the previous model.

The parameter \(\hat{r}_B\) represents the intensity of a bank-firm relationship. Relationship lending is an appropriate lending technique for collecting information on firms. Extensive literature has shown how this relationship assures the firm’s access to credit and gives the bank access to information about the firm (Nakamura, 1992; Berger and Udell, 1995; Boot, 2000), thus suggesting that the cost of credit should decline over time. At the same time, some empirical and theoretical literature on relationship banking offers contradictory results. Peterson and Rajan (1994) suggest that loan interest rates decline with relationship lending, whereas Greenbaum et al. (1989) and Sharpe (1990) demonstrate how lenders may subsidize borrowers in early periods and are reimbursed in later periods, thus increasing the cost of credit during the lending relationship period. We assume a negative relation between the duration of the lending relationship and the cost of credit. Therefore, the longer the relationship lasts (\(\hat{r}_B\) is low) presumably the smaller the increase of the spread on the new debt issued in the event of covenant violation. This is compared to the same spread charged on non-relationship loans (\(\hat{r}_B\) is high), such as loans to a new firm.

Parameter \(\hat{c}_B\) reflects the number of manager banks and the degree of decision-making power delegated by the executive manager in the context of a syndicated loan. Some research suggests that, for a given legal environment, smaller syndicates with fewer manager banks represent “best practices” in terms of reducing renegotiation costs. This is coherent with the hypothesis that renegotiation costs are an increasing function of the number of lenders (Bolton and Sharfstein, 1996; Preece and Mullineaux, 1996). For each level of coordination among banks, the higher the number of managers and the lower the decision power delegated by the lead manager (\(\hat{c}_B\) is high), the higher the relative renegotiation costs in the event of covenant violation.
The parameter $\hat{m}_B$ is correlated to those firm’s characteristics (such as the size, the public or private nature of the firm) that influence the cost of their monitoring activities on the firm according to the coordination level of the individual bank. The easy access to the information concerning the borrowers’ credit worthiness leads to a reduction in monitoring costs. Both the relatively limited publicly available information and the low legal accounting requirements for SMEs reduce the SMEs managers’ incentives to invest in detailed information processes and increase the information available and monitoring costs of the bank. Some research shows that the use of relationship banking to collect information on borrowers leads to a reduction in monitoring costs over time (Blackwell and Winters, 1997). Similarly, in those countries where some mandatory international accounting standards are imposed, an improvement in bank monitoring can be expected (Baas and Schrooten, 2006).

Lastly, the parameter $\mu$ is correlated to the level and quality of collateral pledged as security, should the covenant be violated. Some literature argues that the use of collateral solves asymmetric information problems between borrowers and lenders acting as a selection mechanism (Stiglitz and Weiss, 1981). Borrowers can reveal their worthiness by accepting costly collateral, while bad borrowers do not tend to pledge any collateral (Bester, 1985, 1987, 1994; Chan and Kanatas, 1985; Besanko and Thakor, 1987). Some empirical studies, however, observe the opposite relationship, namely that the riskier borrowers pledge more collateral (Berger and Udell, 1990; Jimenez and Saurina, 2004; Gonas et al., 2004). According to the Basel 2 approach, we consider collateral as a mechanism for credit risk mitigation. Therefore, for each level of covenant threshold, the higher the collateralization ($\mu$ is high), the higher the expected decrease in the $EL$.

By substituting the linear expressions of (32) into the bank’s minimization problem, as reported in the expression (22), we get the optimal level of the covenant threshold, expressed as a function of all parameters, which is:

\[
d^* = \frac{1}{2} + \frac{\hat{r}_B \hat{c} + \mu + \hat{c}_B \alpha}{2\hat{r}_B}
\]

Using the equation (33) it can be shown that the covenant tightness changes if the parameters $\hat{q}, \hat{r}_B, \alpha$ modify, according to the following:

\[
\frac{\partial d^*}{\partial \hat{r}_B} = -\frac{1}{2} \frac{\hat{c}_B \alpha + \hat{q} + \hat{c}_B + \mu}{\hat{r}_B^2} \leq 0
\]

\[
\frac{\partial d^*}{\partial \hat{q}} = \frac{1}{2\hat{r}_B} \geq 0
\]
\[ \frac{\partial d^*}{\partial \alpha} = \frac{c_B}{2B} \geq 0 \]  

(36)

If the bank has established a lasting relationship with the firm, thus benefiting from easy access to firm’s information, the loan covenant can be set at a lower threshold, compared to that issued for non-relationship loans, as expressed in (34). As in the firm-bondholder model, younger firms with higher growth opportunities can preserve their flexibility needs by issuing a less restrictive covenant, as expressed in (35). With regard to the relationship between the optimal covenant threshold and the level of coordination, the expression (31) shows that as the coordination among the banks decreases (\( \alpha \) increases), the tightness of the covenant decreases (\( d \) increases). Furthermore, due to the high expected renegotiation costs in the event of covenant violation, which depend on their low and therefore costly coordination level, the banks will agree to include a lesser restrictive covenant as part of the loan contract.

### 5. Conclusions

Covenants can be an effective tool to reduce the conflict of interests between firm and debtholders. The lack of coordination between the debtholders may, however, reduce its efficiency due to the high amount of expected renegotiation costs following eventual covenant violations. The empirical evidence shows, in fact, that when bank loans are given where coordination is high, these costs are lower and use of covenants is more efficient. With the help of two theoretical models, we identify the cost of lack of coordination among bondholders with regard to public debt, and for banks with regard to private debt. In both models we (1) find that there is a minimum coordination level which guarantees the covenant efficiency, and we (2) identify the optimal covenant threshold. Looking at the second result in more depth, we find that there is a direct relation between the tightness of the covenant and the degree of the debtholder coordination. Therefore, in order to benefit from a mitigation in the agency costs, the debtholders are forced to increase their degree of coordination, as pointed out by Berlin, et al. (1998). In the area of public debt, some studies have suggested the creation of a particular type of trustee (Amihud, Garbade and Kahan, 2000; Bratton, 2006; Schmidt, 2006). With respect to the private debt, however, the role played by the lead manager, normally present in syndicated loans, is coherent with the conclusions of our model.

The proposed analysis can be expanded both theoretically and empirically. The theoretical framework can be further investigated (1) by introducing a more specific function on the model’s variables, and (2) by indentifying the optimal choice for the firm be-
tween bond or loan covenant. Moreover, there is also an empirical implication to the model which tests its validity in offering an useful decision-making instrument, both to the firm and the bank. Indeed, by using empirical results of previous studies the optimal combination of covenant threshold and spread reduction of both the private and the public debt instrument can be defined, and the most cost-effective financing choice can be found.

6. References


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