



Working Paper 03
Business Economic Series 02
January 2012

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“A theoretical analysis of the stages and events experienced by financially distressed firms”

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Abstract

This paper analyses the events that start with financial distress and may eventually lead to the liquidation and/or abandonment of the assets of the firm. It develops a scheme describing the sequence of possible outcomes starting with financial distress based on the existing literature and taking into account the legal environment in terms of liability and priority rules and bankruptcy law. An analysis of the treatment of financial distress in the theoretical financial literature is also performed, showing that there is no consensus in the treatment of financial distress. The common case of assuming simultaneous default and bankruptcy is shown to lead to suboptimal bankruptcy. Other theoretical approaches are shown to address this problem in different ways such as separating default from bankruptcy or by including protective covenants. The case of separation between default from bankruptcy or liquidation highlights the importance of the interaction between the different options present in financial distress. The general case of exogenously determined default is shown to represent a special case that implies the existence of financial and credit constraints.

Keywords: Corporate financing decisions, financial distress, real options

JEL Classification: G32, G33

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1 Introduction

Black and Scholes (1973) and Merton (1974) propose a valuation methodology for corporate securities using option pricing theory (OPT). Limited liability and absolute priority rules create option-like asymmetrical profiles for shares and bonds that allow them to be valued as options.

Under this perspective a share is similar to a call option on the assets of the firm in which the strike price is equal to the face value of debt. Under the same perspective, creditors are the conceptual owners of the assets of the firm and have written a call option allowing shareholders to regain full control of the firm once they repay the face value of debt. This call option is not a conventional financial option since it is an option on a real underlying asset, an operating firm. In simple terms, if equityholders exercise the call option there is no default and they once again become the sole owners of the assets of the firm, if the call option is not exercised the equityholders default and debtholders become the owners of the firm (under the role of equityholders).

This represents the simplest application of OPT to corporate finance and, from this simple case, different theoretical branches developed, such as: the valuation of risky debt (e.g. Merton, 1974, Geske, 1977, Leland, 1994) the determination/ measurement of credit risk (e.g. Merton, 1974 and Black and Cox, 1976) and the valuation of different types of strategic options (e.g. McDonald and Siegel, 1986, Myers and Majd, 1990).

In reality, default and the ownership transfer of the firm are two events of a longer process that starts with financial distress and does not simply culminate in a costless transfer of ownership. This paper analyses the theoretical treatment given to these different real options that are embedded in the process that starts with financial distress and ultimately terminates with the liquidation of the assets of the firm or with abandonment. Apart from the already mentioned limited liability and absolute priority rules, there are other equally important legal (bankruptcy law) and contractual aspects (protective covenants) that affect the different stages that follow financial distress in terms of: who decides (exercises the option), what is the criteria for deciding and what are the possible outcomes.

Understanding the process that starts with financial distress is important to both decision makers of firms and to policymakers. The different stages, the process of decision-making and the costs at each stage leading to liquidation are often overlapping in the existing financial literature. To decision makers of firms it is important to accurately value risky debt, model credit risk, determine the optimal capital structure and to properly manage a financial distress. To policymakers it is important to understand this process in order to improve bankruptcy procedures and the theoretical literature analyzing this process should, whenever possible, produce policy suggestions

to improve the efficiency of the bankruptcy process.

The structure of the paper is as follows. Section 2 analyses and defines the events of financial distress, default, bankruptcy, liquidation and abandonment describing the natural sequence of these events. Section 3 analyses how these events are modeled in the financial literature highlighting the positive and negative aspects of each approach. Finally section 4 concludes describing the main gaps and weaknesses of existing literature and pointing out avenues for further research.

2 The process from financial distress to abandonment

Following the seminal works of Fischer Black, Robert Merton and Myron Scholes on OPT Myers (1977) recognized that option pricing theory could be applied to real assets and non-financial investments. To differentiate the options on real assets from the options on financial assets, Myers coined the term real options. There are almost as many types of real options analyzed as there are managerial decisions.

The option to defer investments (often called the option to invest) is probably the most analyzed option and it exists whenever there is uncertainty regarding future earnings, irreversible or partially irreversible investments and proprietorship rights on the investment opportunity. McDonald and Siegel (1986) analyzed such option considering irreversible investments and uncertainty regarding returns and the cost of investment, Ingersoll and Ross (1992) considered irreversible investments and uncertainty regarding the cost of financing. Majd and Pindyck (1987) extend the option to delay for projects with sequential investment outlays (time to build option) showing that such a project could be viewed as a compound option and each stage of investment is an option on the next stage. A similar setting is also analyzed by Carr (1988) that employed sequential options to value several exchange opportunities considering them as compound options.

Margrabe (1978) developed a valuation model for an option to exchange one asset for another, showing that the value of this option depends, not only on the present value of the assets, but also on the variance covariance matrix for the rates of return on the assets under exchange. The analysis of multiple and possibly interacting options was also considered in Trigeorgis (1993). This paper analyses multiple interacting options and shows that the value of a firm with multiple real options differs from the sum of each of the real options valued individually, therefore highlighting the importance of the interactions between the different options.

If the option to defer investments is the most analyzed, the option to abandon is

possibly the most common real option. Most firms are exposed to the possibility of abandoning operations or liquidating the assets of the firm. The only exceptions would be firms which do not have any fixed costs (either operating or financing) and in which the liquidation value of its assets is zero. Myers and Majd (1990) analyze the generally defined option to abandon considering two competing technologies: technology A has a positive salvage value and high operating costs, technology B has no salvage value but low operating costs. In the case of technology A there is an option to liquidate whenever the salvage value is higher than the continuation value, in the case of technology B, in which there is no salvage value, there is an option to abandon a loss making business. Both of these options are important to consider whenever firms experience financial distress, but they are not the only options present, as we discuss next.

2.1 From financial distress to abandonment

The concepts of financial distress, default, bankruptcy and liquidation, found in the financial literature, are often overlapping. Brealey, Myers and Allen (2006) defines financial distress as the failure to meet payments to creditors or when the payment is honored with difficulty. This concept overlaps with default as defined in Meckling (1977), in which default is defined as a failure to make required debt payments on a timely basis or to comply with other conditions of an obligation or agreement. Bankruptcy is defined in Haugen and Senbet (1988) as the mere transfer of ownership from one securityholder to another, Brealey et al. (2006) defines it similarly as a legal mechanism that allows creditors to take over when a decline in asset value triggers default. Liquidation is defined as the process of terminating a business including the sale of assets and the use of the proceeds to discharge liabilities (Pratt, Reilly and Schweis, 2000).

In this paper we follow the previous definitions, but consider a narrower concept of financial distress than the one advocated in Brealey et al. (2006), financial distress means that the firm is facing difficulties and it needs additional financing to meet its obligations. This distinction is important to properly understand the different outcomes of financial distress. Figure 1 represents the sequence of events following financial distress, taking into account the possible different outcomes, which we analyze and briefly discuss next.

[Insert Figure 1 here]

2.1.1 Financial distress

Geske (1977) defines the equity of a firm with a coupon paying bond issued as a compound option for which, in every coupon date, equityholders have to decide if they will exercise a call option on the next coupon with an exercise price equal to the coupon payment. The last call option is simply a call on the assets of the firm with an exercise price equal to the face value of debt. The exercise of this sequence of call options is automatic as long as the firm generates enough cash to pay the coupons. However, during financial distress the situation is different due to the lack of funds and, for the coupon payments to be honored, the firm has to obtain outside financing. The decision to provide external financing and exercise the call option is in the hands of equityholders (as Myers and Majluf, 1984 argue, equity is the last resource financing source). Following Myers and Majluf (1984), the need for external financing releases new information to the market that investors, creditors and costumers will take into account. This represents the source of the costs of distress such as decreased revenues/cash-flows due to loss of costumers, loss of workers, loss of managerial focus, and tighter business conditions (Baird, 1986 and Webb, 1987). Firms may recover from financial distress if their revenues/cash-flows increase; however, it may be possible that a firm will eventually default on its obligations. This case means that equityholders have decided not to exercise one of the call options associated with a financial obligation.

2.1.2 Default

Whenever the firm does not honor one of its obligations it is said to be in default. Default can be represented in different ways using OPT. Following the same argument as in the analysis of financial distress, default is the action of not exercising one of the call options described in Geske (1977). It can also be represented as the exercise of a put option on the shares of the firm with a strike price of zero. In either case, equityholders default whenever the cash injection they have to make to avoid default is larger than the present value of its shares. When equityholders decide not to honor one of their obligations they simply default. Although there are no obvious direct costs associated with the event of default, Harris and Ravid (1990) argue that debtholders may want to incur investigation costs (e.g. audit expenses) following default to properly decide on the action to take. Bolton and Scharfstein (1990) argue that default generates costs associated with future credit constraints. Brealey et al.(2006) discusses the cost that debtholders charge for the option to default. Brealey et al. argue that corporate bondholders expect to be compensated for awarding equityholders the option to default and the premium on this option justifies why corporate bonds sell at lower prices and offer higher yields than government bonds.

2.1.3 Restructuring

Starting with Stiglitz and Weiss (1981), which gave the first insight into how an interest rate reduction can increase the value of a debt claim, the literature on debt restructuring has expanded considerably. The rationale is similar in all cases and debt restructuring is seen as an acceptable alternative, by both equityholders and debtholders, to a costly liquidation and/or bankruptcy.

Using a binomial model and assuming liquidity constraints, Anderson and Sundaresan (1996) show the possibilities shareholders have to force concessions from lenders, through temporary reductions of coupon payments, under the threat of a costly liquidation process and Anderson, Sundaresan and Tychon (1996) extend this framework to continuous time and perpetual debt. Mella-Barral and Perraudin (1997) consider a similar framework, but in which shareholders are able to make cash injections to avoid default, and extend the analysis of Anderson and Sundaresan (1996) by considering, not only the perspective of maximum bargaining power to shareholders, but also of maximum bargaining power to lenders. Later work by Mella-Barral (1999) refines the concepts of lenders concessions between "deferring" and "inducive" and between "self-imposed" and "forced" concessions and considers the case in which the concessions are not only reflected in reduced coupon payments but also in terms of collateral sharing, providing a rationale for existing deviations from absolute priority rules. All these papers relied on financial constraints to explain the use of debt financing and mostly ignored the role of interest tax shields. Later work by Hege and Mella-Barral (2000) explicitly considers the role of interest tax shields and produces realistic estimates for an endogenously determined optimal capital structure when concessions are permanent. The analysis of multiple and uncoordinated creditors with different priority rules is initially performed in Hege and Mella-Barral (2005) and later extended in Bruche (2010) through the analysis of coordination mechanisms between lenders.

2.1.4 Bankruptcy

Meckling (1977) argues that default and bankruptcy can be considered alternatives; however, in most cases they are sequential events in which default precedes bankruptcy. Brealey et al. (2006) defines bankruptcy as a legal mechanism that allows creditors to take over when a decline in asset value triggers default and the bankruptcy costs are the costs of using this mechanism. Following default, Brealey et al. (2006) argues that debtors and creditors will try to renegotiate before bankruptcy is triggered. Myers also indicates a distinction between distress and bankruptcy when arguing that the value of the firm decreases during financial distress, but bankruptcy is not the cause of this decline in value, it is merely its result. It is worth to notice that not only

levered firms default and go bankrupt. However as Brealey et al. (2006) shows, higher leverage increases the present value of the bankruptcy costs, by increasing the likelihood of financial distress. Research on bankruptcy costs tends to divide them into two categories (Webb, 1987, White, 1989 and Brealey et al., 2006):

- Direct costs: include legal costs, accountants fees and the value of managements time spent administering the bankruptcy;
- Indirect costs: include the opportunity cost of creditors funds tied up during the bankruptcy proceedings and the loss of interest tax shields.

The bankruptcy process differs from country to country and it can be started by equityholders, or managers acting on behalf of equityholders, and debtholders alike. Regardless of differences in national bankruptcy law, the bankruptcy process usually always includes two alternatives (Hart, 1995 and Broadie, Chernov, and Sundaresan, 2007). In the first alternative the outcome of the bankruptcy process is the liquidation of the assets of the firm (the US Chapter 7), in which the asset sale is processed through a cash auction. In the second alternative the outcome of the bankruptcy process is a reorganization of the firm (the US Chapter 11) in which the reorganization is decided through structured bargaining between the different creditors. Usually when the option to start the bankruptcy process is exercised by equityholders or managers the aimed outcome is a reorganization of the firm, conversely, when the option to start the bankruptcy process is exercised by debtholders the aimed outcome is a liquidation of the firm, as evidenced by the large number of Chapter 7 debtholder filings in the US (White, 1989).

As Hart (1995) argues, the first alternative (liquidation usually through cash auctions) has an attractive simplicity from a theoretical perspective. If capital markets work well, the auction should generate an ex post efficient outcome. In particular, if the firm is worth more as a going concern than liquidated, a bid to keep the firm together will dominate a set of independent bids for the assets. On the other hand, if the firm is worth more closed down, a set of independent bids for the parts will dominate a bid for the whole. The advantages of liquidation through an auction are highlighted in Baird (1986) that shows how this method yields higher efficiency in the liquidation of assets. Furthermore, as Hart (1995) argues, liquidation through a cash auction presents additional advantages in the sense that it separates the decision to liquidate from the decision of who gets what. There is no haggling among the claimants about who should get what: the firm is transformed into a pile of cash, which is distributed according to absolute priority (or some other agreed-in-advance rule).

Due to concerns with the effectiveness of cash auctions, a number of countries have developed alternative procedures based on the notion of structured bargaining. The

idea behind these procedures is that the firms claimants are encouraged to negotiate the future of the firm (whether it should be liquidated or reorganized and how its value should be divided up) according to predetermined rules (Hart, 1995).

The US Chapter 11 is a good example of the structured bargaining procedures and its basic elements are as follows: (a) a stay is put on creditors claims, that is, they are frozen and no creditor is allowed to seize or sell any of the firms assets during the process, (b) claim holders are grouped into classes according to the type of claim they have: secured or unsecured, senior or junior, (c) a judge supervises a process of bargaining among class representatives to determine a plan of action and a division of value for the firm. During the process, incumbent management usually runs the firm. An important part of the procedure is that a plan can be implemented if it receives approval by a suitable majority of each claimant class and unanimity is not required.

There is an ongoing discussion regarding the efficiency of bankruptcy law and Hart (1995) summarizes some of its main criticisms, furthermore, he also defines a set of goals for good bankruptcy law and makes some improvements proposals. Chapter 11 is argued to be time-consuming, costly, and too friendly to debtors for not respecting absolute priority. However, Hart argues that there is a fundamental problem inherent in Chapter 11, and in structured bargaining procedures like it, which are not solved with simple adjustments. These problems arise, and justify the costs and time waste of structured bargaining, because structured bargaining tries to make two decisions at once: what to do with the firm, and who should get what in the event of a restructuring of claims. Because a reorganized firm does not have an objective value it is hard to divide the post-bankruptcy value between each group of creditors even if there is no dispute about the amount and seniority of each creditors claim. Because the voting mechanism is fixed in advance, a long negotiation process is expected without any guarantee of achieving an optimal decision.

Hart (1995) questions the existence of the bankruptcy process, and justifies its existence with the inability of agents of being able to contractually define their own bankruptcy rules. As so, and since bankruptcy law fills this market failure Hart defines three goals a good bankruptcy law should achieve:

- Bankruptcy procedure should deliver an ex post efficient outcome, something not guaranteed with pro-creditor or pro-debtor existing bankruptcy laws;
- Bankruptcy procedure should preserve the bonding role of debt by penalizing managers and shareholders adequately in bankruptcy states;
- Bankruptcy procedure should preserve the absolute priority of claims, except that some portion of value should possibly be reserved for shareholders.

In the proposed improvements on existing bankruptcy law, Hart (1995) includes a separation between the decisions of what to do with the firm, and who should get what. In Harts proposal the debt claims are initially converted into equity, and then follows the decision to either liquidate or reorganize the firm. The options to reorganize or liquidate are then in the hands of the firms previous creditors that vote according to the number of shares they have been awarded. This system replaces bargaining among claimants who have different objectives with a vote by a homogeneous group of equityholders.

2.1.5 Liquidation

Liquidation represents the termination of the firm and in comprehends the sale of its assets. Following Myers and Majd (1990), the option to liquidate represents a simple put option on the assets of the firm with a strike price equal to the liquidation value. Basically the option to liquidate is exercised when the assets are worth more dead than alive. There is an important distinction that can be made between the option to liquidate and the option to abandon. In their analysis of competing technologies Myers and Majd (1990) consider both options and the distinction between both represents the liquidation value, whenever the liquidation value is zero, the option to liquidate is simply an option to abandon a loss making business.

Following the natural sequence of events, the decision to liquidate is in the hands of debtholders, either during the bankruptcy process (e.g. US Chapter 7) or following the transfer of ownership that occurs during the bankruptcy process. White (1989) argues that liquidation is the basic procedure of bankruptcy and this explains why in most cases the US Chapter 7 proceedings are launched by the creditors and not by the firm.

Once again, we find in the literature an overlapping of costs for two different events, bankruptcy and liquidation. Altman (1984) considers the costs of dismantling the assets of the firm upon liquidation as a bankruptcy costs, however Haugen and Senbet (1988) classify them more accurately as liquidation costs since they are not directly related with bankruptcy. Liquidation may occur independently of bankruptcy. Furthermore, Alderson and Betker (1995) argue that liquidation costs include as well the fire sale of the assets and the administrative fees related to the decision of liquidation. Shleifer and Vishny (1992) argue that when a firm is in financial distress it is likely that the whole sector experiences similar problems. Since other firms in the same sector are the natural highest valuation buyers of the assets this will lead to assets sales at prices below value in best use. However, in some cases, it is possible to avoid this cost of liquidation. As Williamson (1988) discusses there are assets that have possible

alternative uses, unspecialized assets, which may yield high liquidation values.

3 Theoretical representations of a financially distressed firm

3.1 Default triggers bankruptcy

Despite the fact that, as previously discussed, there are significant conceptual differences between default and bankruptcy, the most common assumption in financial modeling is to assume that default immediately triggers the bankruptcy process. In simple words, default triggers a costly bankruptcy process that culminates in a transfer of ownership from equityholders to debtholders. This approach presents several advantages. It is simple to model, it allows for different outcomes of the bankruptcy process (reorganization, liquidation or abandonment), it allows for the injection of funds in the firm, default is endogenously determined and maximizes the value of the shares respecting limited liability and absolute priority rules. This explains why different branches of financial literature tend to make such modeling assumptions.

We find an extensive use of this assumption in the literature that analyses agency conflicts between equityholders and debtholders regarding the following decisions: decision to invest (Mauer and Sarkar, 2005), the decision to expand (Mauer and Ott, 2000, and Childs, Mauer and Ott, 2005) the option to change the risk of operations (Leland, 1998 and Childs, Mauer and Ott, 2005) and the decision to shut down and restart operations (Mello and Parsons, 1992). In the literature that analyses corporate financing decisions it is also commonly assumed that bankruptcy immediately follows default. We can find this assumption in the analysis of different debt characteristics in terms of quality and protection in Leland (1994) and in the analysis of different debt maturity structures in Leland and Toft (1996).

Although this assumption presents several advantages it still represents an oversimplification that comes with its own problems. By ignoring financial distress and its costs the event of default is unrealistically delayed in time. Furthermore, although default is optimally triggered for equityholders, the costly bankruptcy process is not optimally triggered for debtholders, which are exposed to bankruptcy costs. Relaxing the first aspect would increase the risk for debtholders, but relaxing the second aspect would reduce the present value of the bankruptcy costs. As so it is not clear how this would impact the value of risky debt or the debt capacity of the firm, nor the importance of any possible agency conflicts.

3.2 Exogenously determined default and bankruptcy due to financial constraints

One other common assumption in the financial literature is to assume that there are exogenous determinants that trigger default and bankruptcy. In these cases there is no option to default and the exogenous default triggers simply represent a barrier. There are different justifications for the existence of these barriers. Default may simply be triggered whenever the cash-flows of the firm are insufficient to cover the interest payments of the firm (cash-flow shortage). Ericsson (2000) examines the risk-shifting problem under this assumption considering possible deviations from the absolute priority rule (APR) in default. Ericsson shows that deviations from APR encourage risk taking, lower optimal leverage and reduce the maturity of debt. Titman, Tompaidis and Tsyplakov (2004) also consider an exogenously determined default trigger in their analysis of the option to increase the rate of investment under credit constraints. Titman, Tompaidis and Tsyplakov (2004) analysis of credit constraints highlights one of the main drawbacks of the cash-flow shortage approach, its limited generalization. In order for default to occur due to cash-flow shortage, a number of events must occur cumulatively. Equityholders must be cash constrained and unable to obtain personal loans, no new equity can be issued and lenders are restricting credit. All these assumptions are explicitly or implicitly needed to justify the suboptimal exogenously determined default decision.

3.3 Exogenously determined default and bankruptcy due to financial constraints

Debt covenants are usually written to reduce the risk to debtholders and/or to control potential agency conflicts between shareholders and bondholders. Smith and Warner (1979) define a debt covenant as a contractual provision, which restricts the firm from engaging in specified actions once debt is issued. There are different types of protective covenants and different possible outcomes apart from default when a covenant is breached. Next we describe the most common covenants analyzed following the classification proposed in Smith and Warner (1979):

3.3.1 Production/Investment covenants:

These covenants restrict shareholders production/investments decisions in different ways. (1) Protective covenants may specify the projects which the firm is allowed to undertake (Smith and Warner, 1979), (2) they can impose minimum investment requirements (Titman, Tompaidis, and Tsyplakov, 2004), (3) they may rule out the

sale, lease, transfer, or disposal of any part of its properties and assets (Brennan and Schwartz, 1984), (4) they may lock in specific assets until the bonds are paid in full (Smith and Warner, 1979) (5) they may set a minimum asset coverage ratio in terms of book (Brennan and Schwartz, 1984) or market value (Leland, 1994, Mauer and Triantis, 1994, Leland and Toft, 1996 and Bhanot and Mello, 2006). To breach these covenants and effectively default may trigger different outcomes such as forcing the repayment of outstanding debt, limiting new debt issues, increasing credit spreads, forcing equity injections or even forcing the sale of some assets.

3.3.2 Dividend covenants:

Dividend payments reduce the investment, and the value of the firms bond, making default more likely. Dividend covenants may impose a limit on distributions to equityholders by defining an inventory of funds available for dividend payments over the life of debt (Smith and Warner, 1979), by imposing minimum investment requirements therefore limiting the availability of funds for dividend payments (Titman, Tompaidis, and Tsyplakov, 2004) or by imposing sinking fund deposits (Smith and Warner, 1979).

3.3.3 Financing covenants:

Financing covenants aim to limit the issuance of additional debt or to force the issuance of equity. These covenants impose different restrictions such as (1) minimum asset coverage (book or market value) limiting the borrowing capacity of the firm to a fixed proportion of its asset size (Brennan and Schwartz, 1984, Bhanot and Mello, 2006) or minimum interest coverage requirements (Brennan and Schwartz, 1984). To breach these covenants and effectively default may trigger the repayment of outstanding debt, the issuance of new equity or the sale of some assets.

3.3.4 Bonding covenants:

The most common type of bonding covenants are complex features such as puttable or convertible options (Smith and Warner, 1979). These covenants allow debtholders to exchange debt for either equity or for cash (debt repayment). Protective covenants come in all sizes and shapes, as so, it not unusual to find that imposing an exogenous default trigger not always creates value for debtholders, and especially when we consider that some covenants restrict the sale of assets and the breaching of a different covenant forces the sale of an asset. Production/Investment covenants can limit effectively agency asset substitution problems (Smith and Warner, 1979), however, in some cases, these covenants and the dividend covenants can induce overinvestment in

projects that do not generate value (Smith and Warner, 1979). The specific case of minimum asset coverage ratio covenants (secured debt) is more effective when liquidation is more likely to take place than restructuring (Smith and Warner, 1979). Bahnot and Mello (2006) show that protective covenants do not benefit high risk firms or firms with asset values close to default. Also, those covenants that increase the credit spreads are not efficient mechanisms of controlling the asset substitution problem and may in some cases even stimulate it. Bonding covenants are shown to effectively mitigate agency problems while avoiding bankruptcy. According to Barnea, Haugen and Senbet (1985) the existence of bonding covenants is actually justified by the importance of agency conflicts between equityholders and debtholders.

3.4 Separate default and bankruptcy or liquidation decisions

The traditional approach to assume that default triggers bankruptcy directly exposes debtholders to potentially high bankruptcy costs. The decision to default optimizes the value of equity but the decision to start the bankruptcy process is not optimized, it is imposed on debtholders. A new approach has been modeled separating the decisions to default from the decisions to start the bankruptcy process, to liquidate, or to reorganize the firm. Following the optimal exercise of the option to default by equityholders, an option is created and held by debtholders allowing them to start the bankruptcy process, liquidate or reorganize the firm. Under this approach, both equityholders and debtholders maximize their value sequentially, and the bankruptcy or liquidation costs are minimized.

Harris and Raviv (1990) separate the decisions to default from the decision to liquidate and also consider the role of managers in the process. Harris and Raviv argue that debt plays a disciplining role because default gives creditors the option to force the firm into liquidation and debtholders exercise their option to liquidate optimally. Following default, managers following their self-interests (wanting to avoid liquidation because it means the end of the road for them) must satisfy creditors in order to avoid liquidation and they achieve this either through informal negotiations or through formal bankruptcy proceedings. This alternative outcome of default influences the decision of equityholders to default that must take into account the default costs and the fact that upon default an optimal decision will be made by debtholders either to liquidate or reorganize.

Bruche (2011) models a setting in which, following default, debtholders have the right to demand full payment of their debt and hold an option to liquidate. Bruche shows that optimal default and optimal liquidation occurs at different moments and considering multiple debtholders there are conflicts between equityholders, who want

to liquidate too late, and debtholders who want to liquidate too early. Bruch concludes that these inefficiencies can to some extent be mitigated by adjustments to the capital structure of the firm. Further work by Bruche and Naqvi (2010) has also considered endogenous mechanism for liquidation, reflecting a setting close to creditor-friendly bankruptcy regimes or secured debt. Once equityholders exercise their option to default, debt covenants are triggered awarding debtholders the option to liquidate the firm. Debtholders are found not to liquidate the firm immediately upon default but are willing to accept reduced coupon payments (i.e. partial default on coupon payments) in hope that the firm may recover. If the firm deteriorates further debtholders will eventually exercise their option to liquidate. Bruche and Naqvi (2010) show that the default level affects the incentives to liquidate. The earlier default occurs, the lower is the continuation value to debtholders, and hence the earlier they will want to liquidate. Recursively, equityholders incorporate this outcome in their decision to default. This separation of the option to liquidate from the option to default delays the exercise of both options increases the value of debt and the optimal capital structure.

Broadie, Chernov and Sundaresan (2007) follow a similar approach but consider a formal US bankruptcy process, defining a sequence of options regarding the decisions to reorganize or liquidate and the transfer of the control rights between equityholders and debtholders. They argue that equityholders have two options (option to liquidate and option to reorganize), and the control rights are theirs to exercise one of these options. However, if they exercise the option to reorganize under Chapter 11 (debt reorganization and/or suspension of contractual payments), the control rights are transferred to debtholders. Debtholders now have two options, the same option to liquidate and the option to keep the firm operating. Similarly to Bruche and Naqvi (2010), Broadie, Chernov and Sundaresan (2007) also conclude that the separation between default and bankruptcy also increases the optimal capital structure. The separation between the decisions to default, liquidate or start the bankruptcy process highlights the sub optimality of the traditional approach of assuming that bankruptcy follows default. Several aspects are quite interesting when these options are separated such as the importance of default and/or bankruptcy costs for an equityholder with limited liability and the higher debt capacity of firms when debtholders are able to maximize their value following default. The assumption of separating default from bankruptcy or liquidation highlights the importance of the interaction between the different options as analyzed in Trigeorgis (1993). The impact of bankruptcy costs on the decision of equityholders to default is explained by the interaction effects.

3.5 Avoiding bankruptcy

As Hart (1995) discusses, bankruptcy law address the failure of different financial agents in being able to draw up their own bankruptcy rules. A strand of the literature addresses these aspects by explicitly modeling renegotiation between equityholders and debtholders in order to avoid a costly bankruptcy procedure. Anderson and Sundaresan (1996) show that the threat of bankruptcy costs may facilitate adjustments to the financing of the firm. They study the design and the valuation of debt contracts by incorporating bankruptcy costs in Merton (1974). They show that debtholders may accept deviations from contractual payments because of the costliness of formal bankruptcy. They employ the model to find the combination of contractual features that maximize the debt capacity of the firm.

Hart and Moore (1998) consider the case that following default the creditor has the option to liquidate the firms assets. Assuming symmetric information, but in which there are variables that are not verifiable by debtholders, they show that renegotiation following default will be comparatively straightforward. However, renegotiation is shown not to achieve first best efficiency always. In some situations, the debtholder could hold assets with a value exceeding the liquidation value, in which case there is no way to compensate the debtor for not liquidating the assets (in the case that the default decision is involuntary). Mella-Barral and Perraudin (1997) consider model strategic debt service, by which equityholders force concessions from debtholders reducing the interest payments relative to what was initially contracted therefore avoiding a costly bankruptcy procedure.

A different approach aimed at avoiding bankruptcy is analyzed in Haugen and Senbet (1988). This paper also considers a separation of the option to default and the option to liquidate in a setting with bankruptcy and liquidation costs. Haugen and Senbet show that bankruptcy costs are an insignificant determinant of a firms capital structure and the decision to liquidate, and its associated costs, can be separated from the event of bankruptcy. Moreover, any costs associated with the event of bankruptcy are limited to the costs associated with an informal reorganization of the capital structure before default. The bankruptcy costs can be avoided if there is an adjustment to the firms capital structure before default. One problem with capital adjustments of the type proposed in Haugen and Senbet (1988) is that they rely on the availability of financing by equityholders to retire debt and issue new debt and bear the additional transaction costs associated.

This stream of the literature has important implications that go beyond financing decisions and more recent research has shown that debt restructuring affects significantly other corporate decisions such as investment and expansion. Important contri-

butions are Sundaresan and Wang (2007), which analyses the impact of debt renegotiations on initial investment decisions, and Pawlina (2010), which analyses the impact of debt renegotiations on the decision to expand the production capacity of a firm.

4 Conclusions

The dynamics of a financially distressed firm are commonly oversimplified in financial models and there is an overlapping of the concepts of financial distress, default, bankruptcy and liquidation.

The greatest simplification made in the literature is to assume exogenous default triggers and the immediate start of the bankruptcy process following default. This case is only theoretically realistic if one assumes the simultaneous existence of financial and credit constraints. The main approach of modeling an endogenous determination of default that triggers the immediate start of the bankruptcy process leaves debtholders facing a sub-optimal bankruptcy decision. Several authors recognized the shortcomings of this approach and separated both decisions yielding higher debt values and debt capacity of firms.

The separation of the options to default from the option to start the bankruptcy and/or liquidation procedures highlighted two very important aspects:

- The important interactions between both these options, even considering a simple setting of limited liability and absolute priority rules;
- The impact that this separation of decisions, and the subsequent changes operated in terms of temporary or permanent concessions obtained from debtholders, has on other corporate decisions such as investment and expansion.

Regardless of recent developments, this field of study still presents a wide range of gaps and weaknesses that can be addressed allowing us to develop better representations of the events and stages a financially troubled firm experiences such as:

(1) Following Brealey et al. (2006), one improvement of existing models could be to explicitly model the costs of financial distress, in which the dynamics of firm value change for a distress firm. In this model distress generates significant costs, accelerates default and possibly bankruptcy, increase the price of credit and reduce the debt capacity of firms.

(2) Following Williamson (1988), greater importance can be given to the decision to liquidate the assets of the firm. Considering alternative uses and possibly no correlation between the continuation value and the liquidation value, it would be interesting to analyze how this affects the capital structure of a firm and the role of some debt

covenants such as early liquidation penalties. One easy approach for this scenario would be to use the model developed in McDonald and Siegel (1986) in which there are uncertain returns and uncertain liquidation values (this approach is actually suggested in the original article).

(3) Develop an improved structural model of risky debt by considering the whole sequence of events described in Figure 1, in which there are multiple options that are sequentially exercised by different agents. The interaction between all these different options makes it hard to predict the impact in terms of the debt capacity of a firm. However, Liquidation is often considered a last resource option when in reality it is an option that should be considered even before financial distress. It is not always the case that the liquidation value of the assets is positively correlated with the operating value of the firm. McDonald and Siegel (1986) analyze in their model for default, the case in which liquidation value is uncorrelated and/or probably negatively correlated with the operating value of the firm. It would be interesting to analyze the impact of protective covenants considering this case.

These are all aspects that future research may want to address and the ongoing sovereign debt crisis insures this area of research will remain of interest in the near future.

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Figures

Figure 1: Sequence of events a financially troubled firm may experience

