

Debt-equity choice as a signal of profit profile over time

Anton Miglo*

2003

Abstract

This paper analyzes capital structure under asymmetric information and costly cash holding. Firms have different profit profiles over time, which are their private information. Some firms are “growing” with increasing profit profiles; others are “stagnant” with declining profit profiles. For large public companies, I show that equilibrium is either pooling with debt when the economy is stagnating, or separating when the economy is growing (growing firms issue debt while stagnant firms issue shares). For private firms, equilibrium is almost always separating. This provides new theoretical results, which cannot be explained by the standard pecking-order or free cash flow theories.

*For their particularly helpful comments, I am grateful to Georges Dionne, Claude Fluet and Thomas Noe. I would also like to thank Jean Cossette, Espen Eckbo, Deborah Lucas, Nicolas Marceau, A. Nejadmalayeri, Stephan Pallage, and seminar participants at UQAM, the 2002 CIRPEE conference, the 2003 Midwest Finance Association meetings, the 2003 SCSE meetings and the 2003 International Congress of French Finance Association for their suggestions and comments. The financial support awarded by the Social Sciences and Humanities Research Council of Canada and the Institut de finance mathématique de Montréal was instrumental in enabling my continued research. I also appreciate the organizational support of the chair of CIRPEE and the Economics Department at UQAM, and the editing assistance of Kaarla Sundström. Please address any correspondence to Anton Miglo, CIRPEE and UQAM, C.P. 8888, Succ. Centre-ville, Montréal, QC, Canada H3C 3P8, tel. (514) 987-3000 ext. 6512 or email to: miglo.anton@courrier.uqam.ca.

1 Introduction

The role of asymmetric information in a firm's financial decision-making is well known. One of the most famous theories on this topic, put forward by Myers and Majluf (1984), is the "pecking-order theory" (POT). In their model, the value of both the project and the assets-in-place are known by the firms' managers acting on behalf of existing shareholders, but not by the market. Since the market does not have enough information, the new issued share price is never high enough (mirroring the classic "lemon" problem), which in turn implies the dilution of existing shares even if the new project is profitable. Other principal conclusions of this theory are: whenever possible, firms prefer internal to external financing; and debt is preferred to outside equity.¹ Negative market reactions to equity issues have been empirically confirmed many times starting with Masulis and Korwar (1986) and Mikkelsen and Partch (1986). Myers and Shayam-Sunders (1999) empirically verify POT and conclude that this theory is a very compelling explanation of capital structure decisions.

The following discussion about POT highlights the motives of the present paper. (i) The prescribed pecking order is too rigid in that it does not depend on macroeconomic conditions. More specifically, how do we explain the large volumes of equity issues (compared to the total volume of issued securities) that have been observed in expansionary phases of the business cycle? Choe, Masulis and Nanda (1993) suggest that this is because the extent of asymmetric information is greater when the economy is in contraction, making the informational dilution cost of equity issues much higher in these periods. However, some recent research argues that the difference between cycle phases regarding the extent of asymmetric information does not seem to be evident.^{2,3} (ii) It is difficult to even speak about the operating performance of firms issuing equity within the context of POT since, according to the standard structures of this theory, no firms would ever issue equity. For instance, POT has very little support in discussions about such puzzling phenomena as the long-term afterissuing underperformance of firms issuing equity.⁴ Another reason for this is that literature on POT usually considers one-period securities issue models, which cannot be interpreted with certainty as the basis of any long-term phenomena.⁵ (iii) In addition, POT cannot rigorously

explain the famous negative correlation between debt and profitability. If investment opportunities are non-correlated with profits, POT is consistent with this phenomena because a greater number of high-profit firms have more opportunities to finance internally, thereby decreasing leverage. If they are correlated with profits (which is most likely to be the case when the economy is performing well) and internal funds are not sufficient for financing, we get two opposite intuitions—growing profits cause internal financing to increase, which in turn decreases leverage, while large growth opportunities demand external financing, which can increase leverage. (iv) And finally, there is some recent empirical research that is unable to confirm that firms follow POT (for example Frank and Goyal, 2002).

In this paper I provide a dynamic model with asymmetric information that: 1) explains why the ordering of financing modes can be flexible and why macroeconomic conditions are important in determining that order; 2) confirms certain financial market observations that POT cannot explain. For example, I show that if the economy is growing, some firms issue equity in equilibrium. I also argue that debt signals a firm’s increasing performance in the long run, while equity signals decreasing performance; 3) gives new theoretical results that have hitherto been untested.⁶ For example, I show that equity issues are likely to be procyclical for large or publicly traded firms that tend to have a strong separation of owners and managers and the high agency cost of cash holding.

Logically, the first way one might try to apply asymmetric information to multi-period environments is to consider a repetition or a similar extension of a static game (like Myers-Majluf’s). It can be shown, however, that this would have a limited capacity to explain many of the equity issues phenomena described above.⁷ In contrast, I assume that managers issuing equity often have information about profit expectation for more than one period, given that equity issue has the greatest influence on all long-term aspects of a corporation.⁸ Of course, in this case, repetition is no longer an appropriate method of analysis. In focusing on purely dynamic aspects, a useful approach would be to assume that all different types of firms have the same average profit but have different profit profiles over time, which are their private information. Specifically, I analyze an economy where some firms are “growing” and have an increasing expected profit, while others are “stagnant” and have a flatter or decreasing expected profit.

There are two interpretations of the assumption that firms have the same average profit. The first is Adam Smith’s idea of the market’s invisible hand,

which implies equal profit for all firms. In the long-term, this is even more reasonable given that time smooths out subjective differences among the firms. The second interpretation is that firms may have different average profits, but the market is able to recognize these average profits. For example, market participants can benefit from long-term profit forecasts of credit rating agencies or analytical firms etc. Thus, on the market, firms are clustered according to their expected average profits. Timing of investments and other elements of corporate strategy, which can affect profit profile over time, are always a firm's private information.

One possibility of solving the problem of imperfect market information about profit profile over time is to use up-front financing (which is equal to the total volume of investments). Specifically, the first-period outsider shareholders would not suffer from their informational shortfall since total profits are the same for all types in this mode of financing. However, up-front equity financing creates free cash flow that should be "transported" from the first period to subsequent ones. This provides the incentive for managers to manipulate this free cash flow in their own interests, which are not necessarily aligned with the interests of firm value maximization (Easterbrook (1984) and Jensen (1986)). Hence, up-front financing is undesirable, making stage financing (where resources are raised in the same period as investments) the logical focus of my analysis.⁹

In such an environment, and assuming for simplicity that the time-horizon is divided into two periods, prices can be affected by the "lemon" effect in both periods. Intuitively, growing firms would seem to have an informational advantage in the first period: because of lower profits in this period, this firm type can capitalize on the adverse selection problem. On the other hand, in the second period the informational advantage passes to the stagnant type. I show that growing and stagnant firms face very different incentives regarding financial decisions. The point is that, generally speaking, debt has a shorter maturity than equity, which has by definition infinite maturity. Thus, the price of first-period equity is type-independent due to the two-period maturity of equity (contrary to the one-period of debt) and to the fact that both types face the same total profit over the two periods. As a result, if growing firms were to issue equity in the first period, they would always be mimicked by stagnant firms, who stand to gain in the second period by being perceived as growing and, therefore, as expecting high profits in the second period. The implication is that growing firms are at a disadvantage for equity issues in the first period. This is the main engine driving the

results of this article.

While growing firms would definitely prefer debt to equity, incentives for stagnating firms depend on the macroeconomical situation. The idea here is that if the economy is growing—there are on average more growing than stagnating firms—interest rates tend to be more suitable for growing firms. In particular, first-period interest rates would be relatively high compared to those of the second period, because the growing types are considered “bad” in the first period and “good” in the second. Given such an interest rate profile, I show that if the stagnating firm plays debt, it would be beneficial to creditors, but not to the firm. This is because the creditors obtain great benefits in the first period due to the high interest rates and to the fact that stagnating firms do well at this time.

There are not many examples of dynamic signaling games involving equity issues and addressing similar problems. One notable exception is Lucas and MacDonald (1990) who present an infinite horizon model of equity issues with asymmetric information. In their model, only equity financing is available. The projects are of long duration and waiting is not too costly. Thus, undervalued firms delay issue until the undervaluation is corrected. The authors argued that these firms would have above average performance preceding the equity issue, whereas overvalued firms would issue immediately and have only average performance prior to issue. This paper explains why equity issues on average are preceded by abnormally positive stock returns and why equity issues are positively correlated with stock market performance.

In Berkovitch and Narayanan’s (1993) interesting paper, firms can time their projects and the financial market is imperfect. They assume that financial intermediaries providing financing can observe some information about firm type, thereby acquiring some advantages over other market participants. Low-profitable projects tend to be financed with equity and high-profitable projects with debt. Low-profit firms would not mimic high-profit firms (in contrast to standard POT) because they would be subjected to higher rates of switching rent imposed by intermediaries. When the economy performs well, more low-profitable projects can be undertaken. Thus, equity issues are more frequent in periods of economic growth. Note that this paper is less powerful in explaining the negative correlation between firm profitability and debt financing.

Viswanath (1992) replicates Myers-Majluf model for a dynamic environment by actually retaining the same structure—there are “bad” and “good”

firms, with assets-in-place and initial financial slack (where managers have information for one period in advance). In his model, a manager looking for financing for a two-period investment project chooses between using cash and issuing equity. When financial slack is limited, using cash in the current period resolves the “lemon” problem for this period but not for the second. Viswanath shows that managers often prefer to keep cash for future investments and will instead issue equity in the first period. While the main objective of his paper is to explain why equity issuing is not always accompanied by an immediate pricefall, the author also provides some intuitive ideas about why there are large equity issues at the peak of a business cycle.¹⁰ If the future is more valuable, cash becomes more valuable and thus equity is issued more often. It is worth mentioning that this model is not consistent with long-term afterissuing underperformance. On the contrary, it predicts that equity issues are positively correlated to future performance.

My paper differs from these articles in that it allows firms to issue both debt and equity, it keeps a perfect competition among investors and simultaneously explains: 1) the negative correlation between debt and profitability; 2) the link between capital structure and business cycle; and 3) the long-term afterissuing underperformance of firms issuing equity. The main methodological difference between my paper and most literature on asymmetric information is that other authors distinguish firms through the traditional duality of the terms “bad” and “good”, whereas I use “growing” and “stagnating”.¹¹

Before moving forward, I would like to note that free cash flow theory on its own, albeit playing an important role in this paper, is unlikely to explain many phenomena such as the procyclical character of equity issues or the negative correlation between debt and profitability. Since debt is an instrument of solving the problem of a manager’s entrenchment, increasing the cash during periods of expansion will merely produce more debt (see Chaplinsky and Niehaus, 1993).¹² Also noteworthy is the paper of Noe and Rebbello (1996), which is one of the first examples of combining asymmetric information with manager entrenchment. They consider a static model and obtain some interesting results about capital structure and payout policies for firms with different ownership structures. My paper shares two important features with theirs: there is universal risk neutrality; and managers and internal shareholders both know the firm’s type while the market does not. However, their paper differs in some key ways: the conflict between both insiders exists because the manager can opportunistically renegotiate his contract; information is asymmetric regarding (as usual) firm quality;

and the primary driver of shifts in equilibrium capital structure decisions is the extent of asymmetric information, not the macroeconomical situation. While both papers share the conclusion that under symmetric information and shareholder control, optimal policy is to pay maximal dividend and to issue debt, our findings under asymmetric information are quite different.

The rest of this paper is organized in the following manner. The basic model and some preliminary results are presented in Section 2. Sections 3 and 4 provide the analysis of public and private firms respectively. Section 5 suggests several implications and analyzes their consistency with empirical evidence. Section 6 provides some discussion about organizational forms explored in the paper, and the conclusion is drawn in Section 7.

2 Model description and some preliminary results.

The time horizon for each firm involves two periods of equal length, which may be interpreted as the near future and more distant future. In each period $t, t = 1, 2$ an amount b has to be invested. The project can either be successful (with probability θ_t) or unsuccessful (with probability $1 - \theta_t$). If the former is the case the revenue equals 1 and if the latter is the case the revenue equals 0. To generate the basic ideas, we first consider a two-type economy. We assume that θ_t can have only two values: θ_H (for high expected revenue) and θ_L (for low expected revenue), $\theta_H > \theta_L$. Firm G (for ‘grower’) is characterized by θ_L in the first period and by θ_H in the second. Firm S (for ‘slower’) is stagnating, which means that it is characterized by θ_H in the first period and by θ_L in the second. Clearly, the expected total revenue for both types is equal to $\theta_L + \theta_H$. Without loss of generality, we can normalize it to unity and thus we can write $\theta_L = \theta$ and $\theta_H = 1 - \theta$ where $\theta < 1/2$. Since the investment is profitable in each period, $b < 1/2$ and $\theta > b$.

The firm’s shareholders are responsible for the strategic decisions such as capital structure choice and profit distribution.¹³ Current decisions are the responsibility of an incumbent manager. The manager possesses unique skills for current decisions in the realization of the project and cannot be fired. The firm maximizes wealth of initial shareholders, who I will call the entrepreneur. We will consider two cases: one can be seen as a large company or a company with publicly traded shares (I will call this a public

firm) and another as a small or private firm. The main features of each type are the following. For the public firm, 1) there is strong separation between ownership and current control; 2) shareholders are numerous and are highly dispersed; 3) the manager possesses a relatively low part of the capital (for simplicity, I assume that the manager has no shares). For the private firm, the manager and entrepreneur are closely connected. In the model, I assume that the manager is the initial firm owner of the private firm.

Initial capital structure is 100% equity. Let n be the number of shares initially in existence. At least in the first stage, firms will finance externally since there are no initial internal resources available. Let α_o^t/α_c^t denote the proportions of equity owned by outsiders/entrepreneur in the beginning of period t . Clearly, $\alpha_o^t + \alpha_c^t = 1, \forall t$. Insiders (shareholders and manager) know the firm type, but the market does not. The distribution of types is common knowledge. Let μ_0 be the proportion of type G firms, $0 < \mu_0 < 1$. There exists universal risk-neutrality in this economy. In addition, the competition among investors is perfect.

2.1 Financing strategies.

In the first period, firms may issue both debt (d) or equity (e).¹⁴ In both cases, the firm gets amount b from the market, which is immediately invested. Also, the firm can issue equity for up-front financing (u).¹⁵ In this case, the firm gets in the first period the total amount of investment $2b$, immediately invests b and holds the second half for the second period investment. Debt is short term (one period), which underlines the idea about the shorter maturity of debt compared to equity. Thus, in the second period only debt or internal financing (if available) is possible.^{16,17} As in the standard literature of this field, I assume that the contract of debt is enforceable at no cost.

Holding cash flow is costly and the causes are well-known: “empire building” or inefficient investments and acquisitions, which spread the resources under the manager’s control; increasing manager compensations or direct entrenchment; etc.¹⁸ More specifically, I assume that the manager can capture any free cash flow in total in this model.¹⁹ When deciding about this, the manager faces the trade-off between the possibility of an immediate wealth increase and a future loss due to the “lemon” problem when financing is external.

For public firms, any negotiation about capturing cash between entrepreneur and manager is impossible (otherwise, the solution will always be debt be-

cause there are no incentives to pay dividends to outsider shareholders). Also, it is not possible to write a contract that reads, “if you are honest, I will pay you more”. First, it would be very difficult to specify all of the manager’s possible strategies and the outcomes in each situation. Second, if such a contract were possible, it is not clear what the difference is with common cash capturing because such a contract would necessarily compromise the entrepreneur by revealing to the third party that he knows the manager is dishonest. Third, it would be difficult to force the entrepreneur to pay extra-benefits to the manager after second-period profit realization because he can simply fire the manager, which is ultimately not useful. In addition, it is impossible to renegotiate by transferring shares to the manager. This means that by repurchasing shares, the manager could align his interest with the interests of the whole firm and thus can influence his incentive to entrench. However, in the case of a public company, it would be difficult to achieve such a solution because shareholders are largely dispersed. Consequently, the manager always has the incentive to divest all free cash and the optimal solution for shareholders is to distribute first-period profit in total.

In contrast, the repurchasing of shares by the manager is possible in private firms. Increasing the manager’s ownership can be profitable if the firm is subject to the lemon problem when financing is external. This allows the manager to credibly commit to not capturing non-distributed profit, making internal financing possible in the second-period.

Finally, I assume that the firm that failed to pay the total debt in the first period does not lose its ability to invest in the second. This does not contradict the risk-neutral valuation because debtholders (who “live” only one period) always have b in equilibrium (expected payoff), but nominal debt D is not always completely paid.²⁰ This construction of debt can be interpreted in the following way. First, the cost of bankruptcy court is very high. This means that the lenders of the first period, when determining the interest rate, only look at their expected payoff for the current period and, if the payoff is less than the face value of the debt, do not take into consideration something more (like converting debt to the firm’s shares etc.). Second, any possible collateral is too costly.²¹ Finally, when pricing the first period debt, the lenders do not consider the possibility of junior debt in the case of insolvency (debt on debt). Similar constructions of debt in a dynamic environment are in Webb (1991) and in Diamond (1991), where there is no bankruptcy court, the lenders “live” only one period and the interest rate is only based on the expected payoff of this period (there is no collateral or

junior debt etc.).

First-period outsider shareholders discover the firm's type immediately after acquiring shares. The second period financial outsiders have observed first-period capital structure choice. However, they have not observed the profit previously realized by the firm and whether or not the manager has captured any profit.

2.2 Symmetric information.

This section provides some useful information about benchmark pricing, which is when the market knows the firm's type and the manager cannot capture free cash. The sequence of events is as follows: entrepreneur determines first-period capital structure and makes investment; project yields first-period profit \tilde{R}_1 ; entrepreneur chooses second-period capital structure; project yields second-period profit \tilde{R}_2 . Consider strategy e with total distribution of first-period profit (the calculus is analogous under other financing strategies). Denote the issue of shares during period 1 by Δn , the price of issued shares by p_e^1 and the second period debt face value by D_e^2 . The equilibrium relations are:

1) first-period budget constraint:

$$b = p_e^1 \Delta n \quad (1)$$

2) market valuation of second-period debt:

$$b = E \left[\min(\tilde{R}_2, D_e^2) \right] \quad (2)$$

3) market valuation of equity issued in the first period:

$$p_e^1 = \frac{\bar{R}_1}{n + \Delta n} + \frac{E \left[\max(0, \tilde{R}_2 - D_e^2) \right]}{n + \Delta n} \quad (3)$$

where $E[\tilde{R}] = \bar{R}$. Given the identity:

$$\min(R, D) + \max(0, R - D) = R \quad (4)$$

and using equations 1 and 2, we can transform 3 to:

$$p_e^1 = \frac{\bar{R}_1 + \bar{R}_2 - 2b}{n} = \frac{1 - 2b}{n} \quad (5)$$

Remark 1. p_e^1 depends only on total firm's profit $\bar{R}_1 + \bar{R}_2$ and not on profit profile over time.

I will use this observation further.

Using equation 2 and conducting a similar exercise for strategy d (e.g. for type S) one can obtain the efficient (symmetric information) face values of debt:

$$D_d^1(S) = b/(1 - \theta), D_d^2(S) = b/\theta \quad (6)$$

Since $\theta < 1/2$, the interest rate profiles in the case of d corresponding to type S is backward sloping (and upward sloping for type G , respectively). Finally, note that regardless of how the investment is financed (debt issue or equity issue), the value of the firm for the entrepreneur is:

$$V = 1 - 2b \quad (7)$$

As usual, under symmetric information, capital structure does not matter.²²

2.3 Asymmetric information with no moral hazard.

When information is asymmetric, the sequence of events in the game is as before except that in the beginning of the game the type is revealed to the entrepreneur and manager but not to the market. Throughout this article, I use the concept of Perfect-Bayesian equilibria and also verify that off-equilibrium beliefs survive usual refinements like Cho and Kreps' (1987) intuitive criterion and consistency (Kreps and Wilson, 1982). In addition, note that perfect competition between outsiders implies a zero market profit and a risk-neutral valuation for any security issued. The proposition below shows why the possibility of manager's entrenchment plays an important role in the model.

Proposition 1. *In the absence of agency cost of free cash holding, there exists first-best pooling equilibrium with u .*

Proof. See Appendix 1. The idea behind this proposition has been discussed in the introduction. This solution no longer holds when the cost of free cash is introduced into the model.

3 Financial structure of public company.

The sequence of events is illustrated in figure 1. We assume that the firm's type is revealed to initial insiders in the period 0.

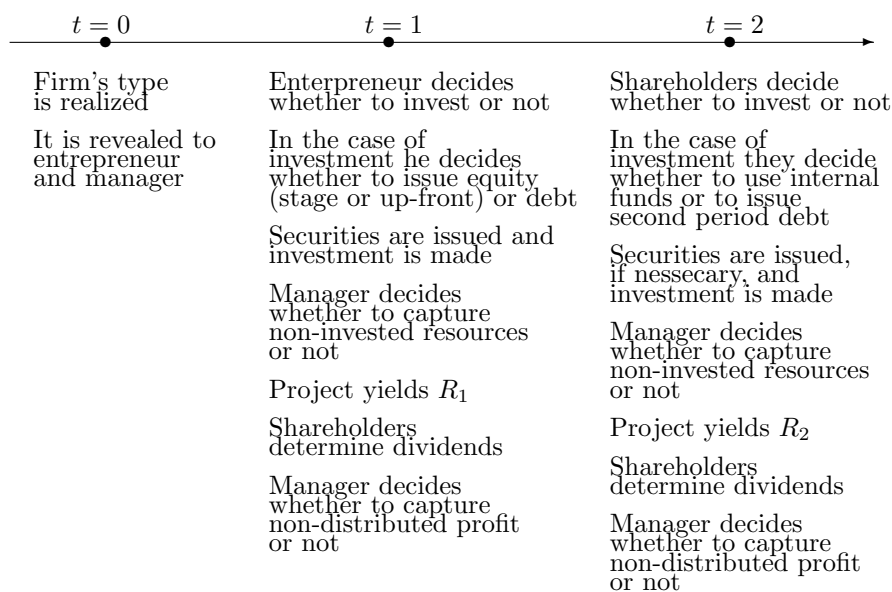


Figure 1. The sequence of events.

First, a public firm never uses up-front financing because any non-invested resources will certainly be captured by the manager, generating a pointless loss for the entrepreneur. For the same reason, first-period and second-period profits will be distributed in total as dividends by shareholders. Next, the entrepreneur always invests in the first period, given the limited liability, the absence of initial wealth in period 0, and the fact that the investment is profitable. The same thing happens in the second period since the first-period profits are distributed in total.²³

Because the firm invests in both periods, the manager captures no cash, and the total profit for both types is the same, we have the following result:

Proposition 2. *In any equilibrium the price of shares issued in the first period is:*

$$p_e^1 = \frac{1 - 2b}{n} \quad (8)$$

This expression characterizes the first period share price under symmetric information, regardless of the issuer's type (equation 5). The same result holds true in a case with asymmetric information (see Appendix 2). The idea behind this result was explained in the introduction. Proposition 2 is a fundamental premise of my analysis. It provides an idea about why growing firms prefer debt to equity—they cannot use their informational advantage in the first-period playing equity because the price is always the same.

Since the first-period profit is totally distributed and in the second period only debt is available, we have a one-decision signalling game about the choice of first-period capital structure. Since each firm may play two types of strategy (d or e), there are 4 potential candidates for equilibrium.

Proposition 3. *1) There exists a separating equilibrium, where G plays d and S plays e ; 2) the situation where G plays e and S plays d is not an equilibrium.*

Proof. See Appendix 3. Intuitively, G does not deviate because by playing e it is not able to capitalize on its first-period informational advantage. S does not deviate because the interest rates profile is backward sloping, making d unprofitable for S (which performs better with upward sloping interest rates profile).

Proposition 4. *1) If and only if $\mu_0 \leq 1/2$, pooling with d is an equilibrium; 2) if $\mu_0 > 1/2$, pooling with e is not an equilibrium; 3) if $\mu_0 \leq 1/2$ and if pooling with e exists, then mispricing is greater under that than under pooling with d .*

Proof. See Appendix 4. First, only if growing firms dominate the credit market ($\mu_0 > 1/2$ if equilibrium is pooling with debt) will the interest rates profile be backward sloping, creating incentives for stagnating firms to play e . Secondly, if pooling with e exists, then mispricing is greater than it is under pooling with d . Intuitively, type G (undervalued under pooling equilibrium,

because S can always achieve first-best using e as a last resort) prefers pooling with debt over pooling with equity. This is because the second-period interest rate is the same in either case, but by playing debt, G gains in the first period by being a bad firm-type. Propositions 3 and 4 are at the root of two major insights of this paper; they provide clues about the link between macroeconomical situations and individual firm capital structure policy, and they show why debt is a signal of a firm’s increasing performance while equity is a signal of decreasing performance.

The main conclusion of the above analysis is that growing firms definitely prefer debt while stagnating firms base their strategy on the macroeconomical situation—if the economy is growing, they will issue equity, and if the economy is stagnating, both strategies can lead to equilibrium. Also note that in a two-type economy, separating equilibrium always dominates pooling by minimal mispricing. However, the intuition about the existence of pooling equilibrium is useful and it will be further applied in section 5.

4 Private firm.

Compared to public firms, private firms are different in a sense that there is no separation between ownership and control. For simplicity, let the initial part of the entrepreneur (manager) be 100%. In order to examine the manager’s financial incentives, it would be appropriate to assume that his salary is negligibly small and that his revenue is composed of dividends and possibly of captured cash. The sequence of events mirrors the sequence in figure 1 except that the manager and entrepreneur are the same agent and, in the case of equity financing, renegotiation between manager and first-period outsiders (whom I will henceforth just refer to as outsiders) can take place at the same time as first-period profit distribution decisions are made.²⁴ I assume that in an opportunity to renegotiate, the manager has all the bargaining power, which means he can make a “take it or leave it” offer to outsiders.²⁵ A direct implication of this lack of separation between ownership and control is the decreasing cost of free cash holding since the interests of the manager and the firm are aligned. In particular, if financing is d and the manager has total control in the second period, he is always interested in financing internally if external financing carries the potential cost of adverse selection (type G). Moreover, since type G makes a gain in the first period playing d , this strategy becomes very attractive for growing firms. Conversely, d be-

comes less profitable for type S . To conclude, in the case of private firms, the conditions of existence of pooling equilibrium with d become very restrictive. Thus, equilibrium is almost always separating, where growing firms play d and stagnating firms play e .

By backward induction, I start the analysis with the second period. Since the interest rate is affected by the “lemon” problem, the growing firm will prefer internal financing if available. These incentives, however, depend on the manager’s second-period ownership (α_c^2) and equilibrium second-period debt face value (D_2). The first determines the relative gain from capturing cash and the second shows the magnitude of the potential problem linked to external financing. Therefore, the managerial strategy must weigh the cost of free cash holding with the problem of second-period asymmetric information. Increasing the cost of free cash holding (decreasing α_c^2) creates an incentive to capture cash, while increasing asymmetric information creates an incentive to finance internally and thus not to capture cash. Intuitively, the degree of the asymmetric information problem depends on the equilibrium face value of second-period debt. The larger this value is, the larger the potential dilution cost is. In appendix 5, I prove that, for the manager of type G , the following inequality is crucial:

$$\alpha_c^2(1 - \theta)D_2 < b \quad (9)$$

When this is true, the manager captures free cash. If $\alpha_c^2 \leq 1/2$, the probability of internal financing is positively linked to second-period debt, to expected second-period profits (adverse selection effect), and to the managerial ownership (cost of capturing free cash). If $\alpha_c^2 > 1/2$ (i.e. $\alpha_c^2 = 1$, which means there will be no profits for outsiders because the manager, who has the control in this case, will not distribute any dividends), inequality 9 is never satisfied because $D_2 \geq b/(1 - \theta)$. Intuitively, if the manager’s interests are completely aligned with the firm, he is only interested in minimizing the “lemon” problem and thus financing is internal.

Now, let us consider the firm’s decision about first-period profit distribution. Let α'_c/α'_o denote the proportions of equity owned by manager/outside investors just before the distribution of first-period dividends.²⁶ First, consider the case when $b \geq 1/3$. This condition insures that if financing is equity and share price equals $(1 - 2b)/n$, then $\alpha'_o \geq 1/2$ (if it is not, there will be no profits for outsiders). Also, the strategy u is not available in this case. If the manager always captures non-invested cash b , the payoff of first-period outsider’s (who invest $2b$) equals $\alpha_o^2(1 - b)$. This is less than $1 - b$ and since $b \geq 1/3$, this is

also less than $2b$. We will consider the case when $b < 1/3$ later. The following proposition describes the optimal rules of first-period profit distribution in any non-degenerate situation (degenerate being any situation where after the first-period issue the market knows the firm's type with certainty. In this case, like in the case of symmetric information, a large variety of afterissuing strategies is possible).

Proposition 5. *1) Type S always distributes first-period profit in total; 2) in the case of d , if $1 - D_d^1 < b$, type G distributes first-period profit in total; if $1 - D_d^1 \geq b$, then it distributes $1 - b$, which leaves b as non-distributed profit; 3) in the case of e , if $\alpha'_o > \frac{1-b}{1+(1-\theta)(1-D_2)}$, first-period profit is distributed in total by type G ; if $\alpha'_o \leq \frac{1-b}{1+(1-\theta)(1-D_2)}$, then it distributes $1 - b$, which leaves b as non-distributed profit (also in this case outsiders sell their shares in total to the manager).*

Proof. See Appendix 5. Type S always distributes first-period profit in total because there is potential gain from external financing in the second period due to the adverse selection problem. In the case of d , condition 9 for type G is never satisfied because $\alpha_c^2 = 1$ and $D_2 \geq b/(1 - \theta)$. Thus, G finances internally when non-distributed profit, after repaying first-period debt D_d^1 , is sufficient for financing. In the case of e , internal financing is desirable for firm G but is subject to the manager's incentive to capture free cash. Since b is relatively high (i.e. $b \geq 1/3$), capturing cash is very attractive to the manager and thus renegotiation is necessary. However, this renegotiation is not possible when the manager's revenue is not sufficiently high to repurchase outsiders' shares. Since the manager's revenue depends on his part in ownership, proposition 5 establishes the critical value of his part such that renegotiation is possible if and only if his part is larger than this critical level. When this is the case, the manager buys outsiders' shares, thereby increasing his part and ensuring that, since he will no longer divest, internal financing is possible.

Proposition 6. *1) If and only if $b \geq \frac{3-\sqrt{5}}{2}$, or $b < \frac{3-\sqrt{5}}{2}$ and $\theta \leq \frac{1-2b}{1-b}$ there exists separating equilibrium, where G plays d and S plays e ; 2) the situation where G plays e and S plays d is not an equilibrium.*

Proof. See Appendix 6. Let us consider the first equilibrium. Compared to public firms, the main difference here is the potential deviation of G in e (for type S , the possibility of internal financing does not matter because it always capitalizes on external financing). Type G is able to have high revenue by playing e even if the market believes that its type is S . The reason for this is that, when outsiders discover the true type, the threat of external financing becomes a serious problem for the outsiders due to the “lemon” problem. For the manager, this means that the price of repurchasing shares is not very high, which in turn makes the renegotiation very profitable. Formally, the sense of proposition 6 is the following. There exists the threshold for b such that if b is greater than this threshold the renegotiation is not possible because the block of shares held by outsiders is relatively large, which does not allow the renegotiation according to proposition 5. In contrast, when renegotiation is possible there exists a critical value for θ such that if θ is below this level, type G does not deviate in e because the probability of high profit is relatively low for type G . This implies that the probability of external financing in the second period for G is high, which in turn implies that the potential disadvantage of playing e will be greater than the potential advantage of renegotiation.

Proposition 7. *Pooling with d is not an equilibrium if at least one of the following conditions holds: 1) $y < 1/2$; 2) $y \geq \frac{b}{1-b}$; 3) $b < \frac{3-\sqrt{5}}{2}$ and $\theta > \frac{1-2b}{1-b}$.*

Proof. See Appendix 7. The intuition about the impossibility of pooling with d when G finances internally was explained at the beginning of this section. This situation takes place when there are many high-profitable firms in the first period, the interest rate is not very high and internal funds are sufficient for financing in the second period. Since $D_d^1 = b/y$, the condition $y \geq b/(1-b)$ insures that $1 - D_d^1 \geq b$, which in turn insures the possibility of internal financing for type G . Also, if the cost of servicing first-period debt is high and the remaining profit is not sufficient for internal financing, type G will finance externally after debt in the first period. Analogously to public firms, if $y < 1/2$, the credit market would be dominated by growing firms and thus stagnating firms would deviate in e . The only situation when pooling with d is possible is when the economy is in slight decline, i.e. when $1/2 \leq y < b/(1-b)$. Finally, the last condition of proposition 7 is analogous

to proposition 6. Even if the economy is slightly declining but playing e is yielding high profits for G , pooling with d is not an equilibrium.

In fact, proposition 7 provides only a necessary and not a sufficient condition for the existence of pooling equilibrium. I have omitted the formal analysis of sufficient condition for brevity. We can nevertheless see in propositions 6 and 7 two main results of this section: (i) in any equilibrium where both strategies are played, G never plays e , as in the case of public firms (ii) for private firms the conditions of pooling equilibrium with d are very restrictive, making this type of equilibrium much less important compared to public firms. For example, if $b = 0.35$, this equilibrium can be possible only if $1/2 < y < 7/13$. In contrast, the conditions for the existence of separating equilibrium are not so restrictive.

If $1/5 \leq b < 1/3$, the formal solution is very similar except for one significant distinction—in the case of e , share price cannot be $(1 - 2b)/n$ because this would mean that the manager has more than 50% of the votes and cannot make a credible commitment to pay dividends. The price of the market is b/n , which gives 50% to outsiders.²⁷ It is obvious that the manager would lose in this situation. However, type S can do better with strategy u . The idea behind this is that while the non-invested first period funds (b) will be captured by the manager, high outsider's ownership insures their high total profit. More precisely, the payoff for the outsiders equals $\alpha'_o(1 - \theta + \theta(1 - b/\theta))$, where $1 - \theta$ is the expected dividend in the first-period and $\theta(1 - b/\theta)$ in the second, given that second-period financing is debt. Since in equilibrium, this should equal $2b$, we have $\alpha'_o = 2b/(1 - b)$. This implies $\alpha'_o \geq 1/2$ because $b \geq 1/5$.²⁸

On a final note, the formal analysis of pooling equilibrium with e is omitted for the sake of simplicity. Intuitively, through an analogy with public firms, this equilibrium does not play any important role in the interpretations of results. I provide more discussion about this in section 5. The conclusions are the same for pooling with u when $1/3 > b \geq 1/5$. Here, in contrast with proposition 1, even if this pooling exists, it does not provide first-best. Since S divests non-invested cash, first-period share price is low, indicating the dilution cost for G .

5 Implications and empirical evidence.

The model developed above provides some rationale for explaining the following facts:

(i) firms issuing equity underperform in the long-run as compared to non-issuing firms (measured as a decline of profit, profit to assets ratio or profit per share). This is implied by propositions 3 and 6: in any equilibrium, where both debt and equity are issued, only the types with low second period profit issue equity in the first period. This conclusion is confirmed by empirical findings (see for example Jain and Kini (1994), Pagano, Panetta and Zingales (1995), Cai and Wei (1997), Mikkelsen, Partch and Shah (1997)) or Purnanandam and Swaminathian (2001) for IPO firms and Loughran and Ritter (1997) for SEO (seasoned equity issues) firms.^{29,30}

Note that in the context of our model's environment, the non-issuing firms are actually the firms that are issuing debt. This is, of course, quite a simplified vision of non-issuing firms as compared to those in the above cited papers. However, as Eckbo, Masulis and Norli (2000) notice and Eckbo and Norli (2001) empirically confirm, issuing firms have lower leverage relative to non-issuing firms. This is consistent with the idea that, unlike issuing firms, non-issuing firms prefer debt financing.

(ii) The performance of firms issuing equity exceeds the performance of the non-issuing firms at the time of issue (or in the near future after issue). Clearly, this also follows from propositions 3 and 6. While this point was not the main focus of the empirical research cited above, some authors did stress the point that issuing firms outperform the non-issuing firms just before issue, and others documented that issuing firms outperform non-issuing firms in the year of issue and in the first year after issue (see Mikkelsen, Partch and Shah (1997) and Jain and Kini (1994)).

(iii) Similarly, the model predicts that leverage is negatively correlated with profitability. In separating equilibrium, first-period low-profitable firms issue debt. This is consistent, for example, with Titman and Wessels (1988), Rajan and Zingales (1995) and Fama and French (2002).

(iv) This paper explains why firms issue equity (Proposition 3 and 6) in opposition to the classic pecking-order theory. When the firm knows that it will be high-profitable in the near future and low-profitable in the long-term, the entrepreneur wants to issue equity, but he is also connected to the macroeconomical situation.

(v) This model provides a rationale about the link between debt-equity

choice and business cycle. The analysis of the basic model reveals the following ideas. Growing firms prefer debt. The incentives for stagnating firms depend on the macroeconomical situation. For firms with the high cost of free cash holding (public firms), if the economy is in contraction, stagnating firms may prefer debt, but will necessarily issue equity when the economy is growing (propositions 3 and 4). Thus, equity issues seem to be procyclical. For firms with the low cost of free cash, equity issues seem not to be procyclical. The reason is that such firms can use up-front equity financing (in absence of any cost of cash holding), mitigating the imperfect information problem (proposition 1), or they can use internal financing for second period investments. This latter option allows the growing type to obtain high profit with debt financing because in the first period it makes informational rent. Therefore, the stagnating firm would have very low profit by playing debt, and hence will almost always prefer equity (propositions 6 and 7).

While section 3 explains the importance of macroeconomical conditions to the existence of pooling equilibrium for public firms, it is not sufficient because separating equilibrium always dominates pooling by minimal mispricing even if pooling exists. However, the basic intuition holds. To illustrate this, consider a multiple type economy. Let firms differ through the parameter θ . A firm of type θ has the probability of success in the first period equal to θ and in the second period equal to $1 - \theta$. $b < 1/2$ and the θ 's are restricted to the interval $(b, 1 - b)$, which implies that the investment is profitable in each period. A firm has increasing expected revenues and profits if $\theta < 1/2$, and the profit profile is moderate or declining if $\theta = 1/2$ or $\theta > 1/2$ respectively. Firm i is 'growing' relative to firm j if $\theta_i < \theta_j$ (note that both may actually be declining, but j would then be declining faster).³¹ If we let θ be distributed according to the density $f(\theta)$, then the total (average) first-period revenue is:

$$y = \int_b^{1-b} \theta f(\theta) d\theta$$

Clearly, total second-period revenue is then $1 - y$. This means that the economy is growing (revenues and profits are increasing) if $y < 1/2$, and it is stagnant or declining if $y = 1/2$ or $y > 1/2$.

The numerical example below confirms the intuition that the macroeconomical situation plays an important role in the solution.³² Let the distribution of type be exponential: $f(\theta) = C \exp(-\gamma\theta)$.³³ The average performance of the economy is determined by the parameter γ : if $\gamma < 0$ then the economy

is stagnating, if $\gamma > 0$, the economy is growing.

Table 1. Business cycle and capital structure.

First let us consider public firms. As we can see, the only qualitative difference with the basic model is that here the existence of “separation” equilibrium is subject to the condition that the economy is non-declining. This is not surprising because in a two-type model, like in the one described in section 2 and 3, type G is not only growing relative to S , but is also growing absolutely. This implies that the interest rate profile is necessarily backward sloping, making it unprofitable for the stagnating firm to mimic this type by playing debt. In the multiple type case, the condition $y \leq 1/2$ insures that in the case of “separation”, the equilibrium interest rate profile would also be backward sloping. As one can see from the table, when the economy is in contraction ($\gamma < 0$), equilibrium is pooling with debt. When the economy shifts to growing ($\gamma > 0$), the volume of equity issue increases rapidly, confirming the result that debt issues are negatively correlated with business cycle. This is consistent with, for example, Choe et al (1993) and Lowry (2003). As shown in section 3, low profit retention rates and high dividends are the key points that generate conclusions about the procyclical nature of equity issues. This is in keeping with Korajczyk and Levy (2003) in that this phenomena should be for the most part consistently observed for such firms. In their article, firms with low retention rates are those with the low cost of external financing, whereas in this paper, firms with low retention rates are public firms with low managerial ownership.

For private firms, equity issues are definitely not procyclical.

(vi) This paper provides some ideas about payout policies. First, dividends should be positively correlated with past performance and negatively with future performance. This is because type S always distributes profit in total while type G does not (proposition 5). This is consistent with empirical findings of Kim, Mauer and Sherman (1998). Second, public firms distribute more dividends and hold less cash than private firms. This is in the spirit of Opler et al (1999) who find that cash holding is smaller for large firms and for firms with low managerial part. It is also consistent with Almieda, Campello and Weisbach (2002). This result is not surprising in our model because firms with low managerial part and dispersed ownership

potentially suffer more from the agency cost of free cash holding. Third, using increasing manager stock of shares should be more pronounced among the growing private firms. In a two-type economy, this does not necessarily happen because equilibrium is separating and thus second-period policy does not matter. However, this does take place in a multiple-type economy. Similarly, managerial buy-out should be more probable among growing private firms.

6 Discussion about organizational forms.

It is clear that for both public and private firms, in any separating equilibrium, growing firms issue debt while stagnating firms issue equity. This conclusion is based on the ideas behind proposition 2. The main difference between public and private firms is brought to light through our analysis of pooling equilibrium with debt. As we have seen, pooling equilibrium is crucially dependant on the financial possibilities of growing firms in the second period. Public firms distribute more dividends than private firms so they finance externally in both periods, while private firms can sometimes finance internally in the second period. There are two reasons for a difference such as this: (i) the manager's ownership is higher in the case of private firms, meaning he won't necessarily predate other shareholders by inefficiently using free cash. Therefore, shareholders have more confidence with regard to managers; they may even leave cash for internal financing; (ii) even if the manager has the incentives to divest, there exists the possibility of renegotiation in private firms, i.e. the manager can repurchase a large amount of outsider shares because outsiders are not as dispersed as they are with public firms (which may also allow internal financing in the second period).

One could say, however, that in the case of public firms, managers could also have a large enough amount of shares, even though they do not have a controlling share block. Let us consider a hybrid firm where: (i) the initial part of the manager equals 50% (minus 1 share); (ii) the renegotiation between manager and outsiders is not possible, as in the case of purely public firms. If $b \geq 1/3$, the manager always divests according to equation 9. For any α_c^2 such that $\alpha_c^2 < 1/2$, we will have $\alpha_c^2(1-\theta)D_2 < b$ given that maximal value of D_2 is equal to b/θ . Thus, the manager always divests according to proposition 4. In this case, the solution is exactly as in section 3 for public firms because first-period profit will be distributed in total. Unlike for public

firms, if $b < 1/3$, the manager does not necessarily divest, making internal second-period financing possible. Separating equilibrium always exists (in contrast with private firms, G never deviates in e because renegotiation is not possible). Pooling with debt occurs less frequently than it does with public firms—since growing firms can finance internally, so too is the case in the realm of private firms. Also, in a multiple-type economy, equity issues are not procyclical when $b < 1/3$. Ultimately, if $b < 1/3$, the solution is comparable to the solution for private firms. In summary, the analysis of organizational type is consistent with all but one of the results of the previous section. The notion of firms with the high cost of free cash used in item (v) should be further qualified. In fact, this should signify whether they are public firms with low manager ownership or firms with high managerial ownership, dispersed outsiders and low long-term profitability (with relatively high b). I have omitted the formal analysis of a hybrid firm such as this for brevity.

7 Conclusions.

This paper rigorously examines *capital* structure in a dynamic setting (two-stage investment process) under asymmetric information and costly cash holding. The analysis is based on the original idea that firms have private information about their profit profiles over time. One of the principle contributions of this paper is that it proposes new explanations for some important phenomena about capital structure such as long-term afterissuing underperformance for firms issuing equity, superior performance of such firms in the time of issue, positive correlation between business cycle and equity issues, and negative correlation between debt and profitability. To my knowledge, this is the first attempt to simultaneously explain all of these phenomena.³⁴

The second contribution is that it provides some new theoretical results that have hitherto not been tested. (i) This paper suggests new motivations for standard security issue, such as debt and equity, that are based on private information about profit profile over time. (ii) It shows that, according to analysis in section 5, the famous long-term afterissuing underperformance for (public) firms issuing equity, as well as negative correlation between debt and profitability, should be more pronounced when the economy is growing.³⁵ (iii) And finally, this paper implies that the important features in the analysis of the connections between business cycle and equity issues is the cost of cash holding, the firm's organizational form (public or private) and the managerial

ownership. For firms with the high cost of cash holding, equity issues are likely to be procyclical.³⁶

The main limitation of this paper is implied by the assumption about equal total profit for all types of firms. This means that while the model can generate results consistent with long-term aspects of equity issues it is less able to explain some short-term equity issues phenomena like underpricing, for example. However, I believe that combining two kinds of signaling (the level of average profit as used in classic pecking-order theory and the profit profile over time as used in this paper) can be a promising direction toward explaining a larger spectrum of equity issues phenomena.

Appendix 1. Proof of Proposition 1.

Take this postulated equilibrium. It is easy to verify that the parameters of this equilibrium (in obvious notations) are: $p_u^1 = \frac{1-2b}{n}$ and $\Delta n = \frac{2bn}{1-2b}$ (total amount of received resources is $p_u^1 \Delta n = 2b$). The entrepreneur's revenue for each type would be (assuming that first-period profit is totally distributed and the firm uses funds received at the beginning to make second-period investments): $\alpha_c^2(\overline{R}_1 + \overline{R}_2)$, where α_c^2 obviously equals: $\frac{n}{n+\Delta n} = 1-2b$, making the entrepreneur's total revenue $1-2b$ since total expected revenue $\overline{R}_1 + \overline{R}_2$ for each firm is equal to 1. According to equation 7, this is equal to the first-best firm value for the entrepreneur. This equilibrium is supported by off-equilibrium market beliefs that the firm is S . Hence S does not deviate. If G plays, for example, d , the entrepreneur's revenue V_d^G , given that 6, is:

$$\theta\left(1 - \frac{b}{1-\theta}\right) + (1-\theta)\left(1 - \frac{b}{\theta}\right) = 1 - b\left(\frac{1-\theta}{\theta} + \frac{\theta}{1-\theta}\right)$$

Since $\theta < 1/2$, the expression in brackets is greater than 2. Thus, $V_d^G < 1-2b$ and G does not deviate. The same is true for other strategies. Also, one can show that market off-equilibrium beliefs survive intuitive criterion. Consider, for instance, d . Let's denote μ_d^S as the probability that the market believes the firm to be type S , after observing d . If $1 > \mu_d^S > 1/2$, the payoff of S would be greater than its equilibrium payoff (see equation 15 below). Therefore, $\mu_d^S = 1$ survives intuitive criterion. *End Proof.*

Appendix 2. Proof of Proposition 2.

Since the firm invests in both periods and the manager captures no cash, the profit of insiders plus the profit of first-period outsiders of firm j equals:

$1 - O_j$, where O_j is the revenue of second-period outsiders of firm j . Thus, the expected sum of the entrepreneur and first-period outsider profits of firm j equals: $E[1 - O_j]$. Since in equilibrium, $E[O_j] = b$, we get $E[1 - O_j] = 1 - b$. Also, in the case of e , α_o^2 (that also shows the fraction of equity held by the first-period outsiders in the moment of first-period profit distribution) equals $\frac{\Delta n}{n + \Delta n}$. Thus, expected profit of first-period outsider shareholders is:

$$\frac{\Delta n}{n + \Delta n}(1 - b)$$

Risk-neutral valuation implies that the expected revenue of first-period outsiders is b . Thus: $\frac{\Delta n}{n + \Delta n}(1 - b) = b$ and $\Delta n = \frac{bn}{1 - 2b}$, which implies (because we know the budget constraint $p_e^1 \Delta n = b$) that $p_e^1 = \frac{1 - 2b}{n}$. *End proof*³⁷.

Appendix 3. Proof of Proposition 3.

(i) *Proof of part 1.* First of all, if the entrepreneur plays e

$$\alpha_c^2 = \frac{n}{n + \Delta n} = \frac{n}{n + b/p_e^1} = \frac{1 - 2b}{1 - b}$$

as implied by 8. Now take the following postulated equilibrium: G plays d and S plays e . Of course, each type has $1 - 2b$ in equilibrium. G does not mimic S because the share's price in the first period does not depend on the firm's type (Proposition 2), while the interest rate in the second period will be unfavorable. Formally, $D_e^2 = b/\theta$. Thus we have:

$$V_e^G = \frac{1 - 2b}{1 - b}(\theta + (1 - \theta)(1 - \frac{b}{\theta})) < 1 - 2b$$

because $\theta < 1/2$. Finally, S does not mimic G . If S plays debt, the value V_d^S is:

$$V_d^S = (1 - \theta)(1 - \frac{b}{\theta}) + \theta(1 - \frac{b}{1 - \theta}) = 1 - b(\frac{1 - \theta}{\theta} + \frac{\theta}{1 - \theta}) < 1 - 2b$$

(ii) *Proof of part 2* is obvious because S would always mimic G in such a situation. *End proof.*

Appendix 4. Proof of Proposition 4.

(i) *Proof of part 1.* 1) Existence. Let $\mu_0 < 1/2$. Consider pooling equilibrium where both types play d , which is supported by off-equilibrium market

believes that the firm is S . First of all, let us verify non-deviation for each type. The equilibrium debt face values D_d^1 and D_d^2 are given by the following equations:

$$b = \mu_0\theta D_d^1 + (1 - \mu_0)(1 - \theta)D_d^1 \quad (10)$$

and:

$$b = \mu_0(1 - \theta)D_d^2 + (1 - \mu_0)\theta D_d^2 \quad (11)$$

Firm G 's payoff in equilibrium is:

$$V_d^G = \theta(1 - D_d^1) + (1 - \theta)(1 - D_d^2)$$

Or (taking into account equ. 10 and 11):

$$1 - b\left(\frac{\theta}{y} + \frac{1 - \theta}{1 - y}\right) \quad (12)$$

where $y = \mu_0\theta + (1 - \mu_0)(1 - \theta)$. If G deviates in e , its payoff is:

$$V_e^G = \frac{1 - 2b}{1 - b}\left(\theta + (1 - \theta)\left(1 - \frac{b}{\theta}\right)\right) \quad (13)$$

because in the second period the interest rate would be b/θ , given the described beliefs above. We must show that $V_e^G \leq V_d^G$. Evidently:

$$V_e^G \leq \frac{1 - 2b}{1 - b}\left(\theta + (1 - \theta)\left(1 - \frac{b}{1 - y}\right)\right) \quad (14)$$

Comparing the expression 12 with the right side of 14 gives:

$$\text{sign}\left[1 - b\left(\frac{\theta}{y} + \frac{1 - \theta}{1 - y}\right) - \frac{1 - 2b}{1 - b}\left(\theta + (1 - \theta)\left(1 - \frac{b}{1 - y}\right)\right)\right] = \text{sign}[(y - \theta)(1 - b - y)]$$

It is positive because $\theta < y < 1 - \theta$. Thus, G does not deviate.

The revenue of type S in equilibrium is $V_d^S = 1 - b\left(\frac{1 - \theta}{y} + \frac{\theta}{1 - y}\right)$. Comparing the expression in the brackets with 2 gives:

$$\text{sign}\left(\frac{1 - \theta}{y} + \frac{\theta}{1 - y} - 2\right) = \text{sign}[(1 - \theta - y)(1 - 2y)] \quad (15)$$

It is negative because $y < 1 - \theta$ and because $y > 1/2$. Therefore, V_d^S is greater than $1 - 2b$ and would clearly equal $1 - 2b$ if it deviates. Thus, type S does not deviate.

Let us now verify that off-equilibrium beliefs survive usual equilibrium refinements. First of all, they are consistent. Second, they survive the intuitive criterion of Cho and Kreps (1987). To show this, let us calculate the maximal payoff of type S in the case that it plays e . Its payoff is evidently maximized if the market's belief places the probability of 1 on type G observing equity:

$$V_e^S = \frac{1-2b}{1-b} \left(1 - \theta + \theta \left(1 - \frac{b}{1-\theta}\right)\right) \quad (16)$$

If off-equilibrium beliefs survive intuitive criterion, this expression must be greater than V_d^S :

$$\frac{1-2b}{1-b} \left(1 - \theta + \theta \left(1 - \frac{b}{1-\theta}\right)\right) > 1 - b \left(\frac{1-\theta}{y} + \frac{\theta}{1-y}\right) \quad (17)$$

Since equ. 16 is greater than $\frac{1-2b}{1-b} \left(1 - \theta + \theta \left(1 - \frac{b}{1-y}\right)\right)$, it is enough to show that:

$$\frac{1-2b}{1-b} \left(1 - \theta + \theta \left(1 - \frac{b}{1-y}\right)\right) > 1 - b \left(\frac{1-\theta}{y} + \frac{\theta}{1-y}\right)$$

Or:

$$(1 - \theta - y)(1 - y - b) > 0$$

This is true because $y < 1 - \theta < 1 - b$. This completes the proof of sufficiency.

2) As for the necessary condition, if $\mu_0 \geq 1/2$ then pooling with d is impossible because type S would deviate in e (its equilibrium payoff would be less than $1 - 2b$).

(ii) *Proof of part 2.* 1) $\mu_0 < 1/2$. In the case of pooling with d , V_d^G is given by 12 and in the case of pooling with e , V_e^G is equal to the right side of 14. As was stated above, the first expression is greater than the second; 2) $\mu_0 \geq 1/2$. We will show that pooling with e does not survive intuitive criterion. In the case of pooling with e , the payoff of S would be:

$$\frac{1-2b}{1-b} \left(1 - \theta + \theta \left(1 - \frac{b}{1-y}\right)\right) \quad (18)$$

Let off-equilibrium market believes be μ_d^G and let $y_d = \mu_d^G \theta + (1 - \mu_d^G)(1 - \theta)$. Firm S 's payoff when playing d is:

$$1 - b \left(\frac{1-\theta}{y_d} + \frac{\theta}{1-y_d}\right) \quad (19)$$

Local minimum of expression in brackets under positive y_d is $y_{\min} = \frac{1-\theta-\sqrt{\theta(1-\theta)}}{1-2\theta}$. Thus, the maximal payoff of S , if it were playing d , would be:

$$1 - b(1 - 2\theta)\left(\frac{1 - \theta}{1 - \theta - \sqrt{\theta(1 - \theta)}} + \frac{\theta}{\sqrt{\theta(1 - \theta)} - \theta}\right)$$

Since minimal value of 18 on feasible support is obtained when $y = 1/2$ (and equals $\frac{1-2b}{1-b}(1-2b\theta)$), to show that pooling with e does not survive intuitive criterion it is enough to show that:

$$\frac{1-2b}{1-b}(1-2b\theta) > 1 - b(1 - 2\theta)\left(\frac{1 - \theta}{1 - \theta - \sqrt{\theta(1 - \theta)}} + \frac{\theta}{\sqrt{\theta(1 - \theta)} - \theta}\right) \Leftrightarrow$$

$$(1 - b)(1 - 2\theta)^2\sqrt{\theta(1 - \theta)} - (2\theta^2 - 2\theta + \sqrt{\theta(1 - \theta)})(1 + 2\theta - 4\theta b) > 0$$

The derivative of the left side over b is negative, thus it is enough to show that this inequality holds under maximal possible value of b , i.e. $b = \theta$. It can be easily shown that $(1 - \theta)(1 - 2\theta)^2\sqrt{\theta(1 - \theta)} - (2\theta^2 - 2\theta + \sqrt{\theta(1 - \theta)})(1 + 2\theta - 4\theta^2) > 0$ on feasible support of θ . Thus, the market would attribute the probability 0 to the possibility of playing d by S . The market would believe that firm is type G after observing debt. In this case, type G would certainly deviate from pooling with e to d . *End proof.*

Appendix 5. Proof of Proposition 5.

Let us take type G and let $\alpha_c^2 \leq 1/2$. By backward induction, I analyze the controlling shareholders' decision about second-period profit distribution, the manager's decision about whether or not to capture non-invested cash in the second period, the shareholders' decision about second-period capital structure and the manager's decision about whether or not to capture free cash in the end of the first period.

Since outsiders have the control in the second period, the decision about second-period profit distribution is obvious—it is distributed to shareholders in total as dividends.

Lemma 1. *Manager captures all non-invested cash in the second period.*

Proof. Let a be non-invested cash. Let second-period financing be external. Denote the amount captured by the manager by z . Manager's profit (without first-period dividend) is: $z + \alpha_c^2[(1 - \theta)(1 + a - z - D_2) + \theta \max(a - z -$

$D_2, 0]$. If $a - z \geq D_2$, then it can be simplified to: $z + \alpha_c^2(1 - \theta + a - z - D_2)$. The optimum is $z = a$. If it does not, then it is: $\alpha_c^2(1 - \theta)(1 + a - z - D_2)$. The optimum is $z = a$. If financing is internal then manager's profit is: $z + \alpha_c^2[(1 - \theta)(1 + a - z) + \theta(a - z)] = z + \alpha_c^2(1 - \theta + a - z)$. The optimum is $z = a$. *End proof.*

The idea of lemma 1 is simple. If financing is internal, the manager captures cash because he is never interested in dividing profits with other shareholders. If financing is debt, it is never profitable for the manager to keep cash because it can only be beneficial for the creditors. Likewise, to leave cash in the beginning of the second period makes no sense for the shareholders.

Lemma 2. *Let A be available cash in the beginning of second period. If $A \geq b$, then financing is internal.*

Proof. This obviously follows from lemma 1.

Lemma 3. *1) Let non-distributed first-period profit be k . If $k < b$ or $\alpha_c^2(1 - \theta)D_2 < b$, then the manager captures k . If it is not, he captures $k - b$.*

Proof. Denote the amount captured by the manager by z . If $k < b$ then the manager's profit (without first-period dividend) is: $z + \alpha_c^2[(1 - \theta)(1 + k - z - D_2) + \theta \max(k - z - D_2, 0)]$. Since $k < b$ implies $k - z < D_2$, the manager's profit equals: $z + \alpha_c^2[(1 - \theta)(1 + k - z - D_2)]$. The optimum is $z = k$. Now, let $k \geq b$. If $k - z \geq b$ then, taking into account lemma 2, the manager's payoff is: $z + \alpha_c^2[1 - \theta + k - z - b]$. The solution is $z = k - b$. If $k - z < b$ then the manager's payoff is: $z + \alpha_c^2[(1 - \theta)(1 + k - z - D_2) + \theta \max(k - z - D_2, 0)]$. Since $k - z < D_2$, then it is: $z + \alpha_c^2[(1 - \theta)(1 + k - z - D_2)]$. The solution is $z = k$. Now compare the payoff under $z = k$ and $z = k - b$. These are $k - b + \alpha_c^2(1 - \theta)$ and $k + \alpha_c^2(1 - \theta)(1 - D_2)$. $z = k$ is optimum if and only if:

$$\alpha_c^2(1 - \theta)D_2 < b \tag{20}$$

End proof.

When $\alpha_c^2 > 1/2$, one should take $\alpha_c^2 = 1$ because outsiders will have no dividends (any received profit will not be distributed and captured after that by the manager). Since the manager has total control, we have: 1) capturing or non-capturing of cash at the end of the first period, second-period capital structure choice, and capturing or non-capturing of non-invested cash in the second period, all of which are the same step; 2) if $k \geq b$, the manager's

solution for this step is also determined by 20: manager will finance internally because $D_2 \geq b/(1 - \theta)$. If $k < b$, the manager captures cash (which is analogous to the case of external financing in lemma 1). *End proof.*

Proof of Proposition 5. Consider type G . First, assume d was played. Type G finances internally (if internal funds after repaying debt are sufficient) because there is always potential loss from adverse selection problem if financing is debt. Now consider e . Since $\alpha'_c \leq 1/2$ and $b \geq 1/3$, we will have $\alpha_c^2(1 - \theta)D_2 < b$ given that $D_2 \leq b/\theta$ and $\theta > b$. Thus, the manager always divests without renegotiation according to lemma 3. Which values of α_c^2 make the renegotiation profitable? For any α_c^2 such that $\alpha_c^2 \leq 1/2$, we will have $\alpha_c^2(1 - \theta)D_2 < b$. In the case when $\alpha_c^2 > 1/2$ the remaining outsiders' shares do not matter because the manager will not pay second-period dividends. Thus, the only interesting case is to sell shares in total to the manager ($\alpha_c^2 = 1$). Since further promises are not credible, payment P to the outsiders is restricted by the amount of the manager's first-period dividend: since renegotiation only makes sense when second-period financing is internal, the amount b of first-period profit would be retained, making the manager's dividend $\alpha'_c(1 - b)$.

The outsiders' incentive is as following. Without selling shares their payoff would be: $\alpha'_o + \alpha'_o(1 - \theta)(1 - D_2)$. With the selling of their shares it would be: $\alpha'_o(1 - b) + P$. Thus, the minimal acceptable payment equals: $\alpha'_o + \alpha'_o(1 - \theta)(1 - D_2) - \alpha'_o(1 - b)$, because the condition for the investor's acceptance of the proposal to sell his shares is that the profit is at least equal to what his profit would be if the dividend were distributed in total. Thus, it is necessary that:

$$\alpha'_c(1 - b) \geq \alpha'_o(1 - \theta)(1 - D_2) + \alpha'_o b \quad (21)$$

or:

$$\alpha'_o \leq \frac{1 - b}{1 + (1 - \theta)(1 - D_2)} \quad (22)$$

Now let us consider the manager's incentive. If financing is external he would have: $\alpha'_c + \alpha'_c(1 - \theta)(1 - D_2)$. In the case of renegotiation it is $\alpha'_c(1 - b) - P + 1 - \theta$. Therefore, for renegotiation to be possible, it should be $P \leq -\alpha'_c b + (1 - \theta)(1 - \alpha'_c(1 - D_2))$. Since $P = \alpha'_o(1 - \theta)(1 - D_2) + \alpha'_o b$, we have:

$$\alpha'_o(1 - \theta)(1 - D_2) + \alpha'_o b \leq -\alpha'_c b + (1 - \theta)(1 - \alpha'_c(1 - D_2))$$

or:

$$b \leq D_2(1 - \theta)$$

This is true. Hence, if condition 22 is satisfied, then shares are sold, which leaves b as non-distributed profit.

Now consider the type S . In the case of d , type S distributes in total because there is no potential gain from either internal financing in the second period (since S is a low-profit type in the second period and it capitalizes on adverse selection problem under external financing) or from capturing non-distributed cash because $\alpha_c^2 = 1$. Now consider e . Since $\alpha_o' \geq 1/2$, control belongs to the outsiders and thus first-period profit is totally distributed by type S , because there is no potential gain from internal financing in the second period. *End proof.*

Appendix 6. Proof of Proposition 6.

(i) *Proof of part 1.* Consider separating equilibrium, where G plays d and S plays e . The proof of non-deviation of S is analogous to proposition 3. As was noted above, the possibility of internal financing in the second period does not matter for S . Consider the incentives of G . Clearly, the manager's payoff in equilibrium V_d^G equals $1 - 2b$. What is it if G deviates in e ? First let us determine when internal financing in the second period is possible. Condition 22 is:

$$\frac{b}{1-b} \leq \frac{\theta(1-b)}{\theta + (1-\theta)(\theta-b)}$$

or:

$$4b\theta - b^2 - b\theta^2 - \theta < 0 \tag{23}$$

Consider the left side as a function of θ . The bigger root is greater than $1/2$. The smaller one is:

$$\frac{4b - 1 - \sqrt{1 - 8b + 16b^2 - 4b^3}}{2b} \tag{24}$$

If $b \geq \frac{3-\sqrt{5}}{2}$, the expression 24 is smaller than b and thus condition 23 is not satisfied on feasible support of θ . Since renegotiation is not possible, G does not deviate (which is analogous to proposition 3). Consider the case when $b < \frac{3-\sqrt{5}}{2}$. In this case, the smaller root of 23 is greater than b . Also, if $b \leq \frac{7-\sqrt{17}}{8}$, then this root is bigger than $1/2$, which means that renegotiation is possible. If $b > \frac{7-\sqrt{17}}{8}$, then renegotiation is possible if and

only if $\theta \leq \frac{4b-1-\sqrt{1-8b+16b^2-4b^3}}{2b}$. When renegotiation is possible, V_e^G would be (taking into account that outsiders' payoff is the same as when financing is external): $\theta(1-b+1-\theta) + (1-\theta)^2(1-\frac{b}{\theta}) - \frac{b}{1-b}(\theta + (1-\theta)(1-\frac{b}{\theta}))$, where the first two terms mean total firm profit and the third term equals outsiders' payoff, given that first-period share price is $(1-2b)/n$ (which is analogous to proposition 2). V_e^G is smaller than $1-2b$ if and only if:

$$2b\theta^2 - 2\theta^2 + 3\theta - 5\theta b + 2b - 1 < 0 \quad (25)$$

The larger root of the left side of 25 equals $1/2$ and the smaller one equals $\frac{1-2b}{1-b}$. Thus, G does not deviate if and only if $\theta \leq \frac{1-2b}{1-b}$. Since $\frac{1-2b}{1-b} < \frac{4b-1-\sqrt{1-8b+16b^2-4b^3}}{2b}$, the following are the conditions of non-deviation of G : $b \geq \frac{3-\sqrt{5}}{2}$ or $b < \frac{3-\sqrt{5}}{2}$ and $\theta \leq \frac{1-2b}{1-b}$.

(ii) *The proof of part 2* is obvious because S will mimic G in such a situation. *End proof.*

Appendix 7. Proof of Proposition 7.

Let's consider pooling equilibrium where both types play d and where off-equilibrium market believes μ_e^G equals 0, meaning that the equity market believes that the firm is of type S .

(i) Consider first $y < 1/2$. In this case, G finances externally in the second period and thus, as we know from proposition 4, the payoff of type S would be less than $1-2b$ and it would deviate in e .

(ii) Now, let:

$$y \geq \frac{b}{1-b} \quad (26)$$

In this case, G finances internally in the second period according to proposition 5 because $1 - D_d^1 \equiv 1 - \frac{b}{y} \geq b$. Let us verify non-deviation for type S . The equilibrium debt face values D_d^1 and D_d^2 are given by the following equations:

$$b = \mu_0\theta D_d^1 + (1-\mu_0)(1-\theta)D_d^1 \quad (27)$$

and:

$$b = \mu_2(1-\theta)D_d^2 + (1-\mu_2)\theta D_d^2 \quad (28)$$

where μ_2 is the probability that the market's belief places on type G in the second period. Since type S always finances externally and type G only if

the profit equals 0 (proposition 5) we have:

$$\mu_2 = \frac{\mu_0(1-\theta)}{\mu_0(1-\theta) + 1 - \mu_0} \quad (29)$$

The revenue of type S in equilibrium V_d^S is:

$$1 - b\left(\frac{1-\theta}{y} + \frac{\theta}{\mu_2(1-\theta) + (1-\mu_2)\theta}\right) \quad (30)$$

Comparing the expression in the brackets with 2 gives:

$$\text{sign}\left(\frac{1-\theta}{y} + \frac{\theta}{\mu_2(1-\theta) + (1-\mu_2)\theta} - 2\right) = \text{sign}[\mu_2(1-2\theta)(1-\theta-2y) + \theta(1-\theta-y)]$$

If $1-\theta > 2y$, it is positive because $y < 1-\theta$ and because $\theta < 1/2$. Thus, V_d^S is smaller than $1-2b$ and would clearly equal $1-2b$ if it deviates in e . Therefore, for equilibrium to exist, the following condition is necessary:

$$1-\theta < 2y \quad (31)$$

In this case, the sign of the expression in brackets is negative if and only if:

$$\mu_2 > \frac{\theta(1-\theta-y)}{(1-2\theta)(\theta+2y-1)}$$

Replacing y by $\mu_0\theta + (1-\mu_0)(1-\theta)$ makes this inequality equivalent to:

$$\mu_0(6\theta - 3\theta^2 - 2) + 1 - 3\theta + \theta^2 > 0 \quad (32)$$

Within feasible support for θ , we have: $6\theta - 3\theta^2 - 2 > 0 \Leftrightarrow \theta > 1 - \frac{1}{\sqrt{3}}$ and $1 - 3\theta + \theta^2 > 0 \Leftrightarrow \theta < \frac{3-\sqrt{5}}{2}$. The following situations are possible.
1) $\theta < \frac{3-\sqrt{5}}{2}$. This implies:

$$\mu_0 > \frac{1-3\theta+\theta^2}{2+3\theta^2-6\theta}$$

This contradicts 31. The latter is equivalent to:

$$\mu_0 < \frac{1-\theta}{2(1-2\theta)}$$

but $\frac{1-3\theta+\theta^2}{2+3\theta^2-6\theta} > \frac{1-\theta}{2(1-2\theta)}$ because $\theta < 1/2$; 2) $\frac{3-\sqrt{5}}{2} < \theta < 1 - \frac{1}{\sqrt{3}}$. The condition 32 does not hold because its left side is negative; 3) $\theta > 1 - \frac{1}{\sqrt{3}}$. We have: $\mu_0 > \frac{3\theta-\theta^2-1}{6\theta-3\theta^2-2}$. Since $\mu_0 = \frac{1-\theta-y}{1-2\theta}$, this is equivalent to $y < \frac{3\theta-2\theta^2+\theta^3-1}{6\theta-3\theta^2-2}$. It can be easily verified that this contradicts 26 when $y > 1 - \frac{1}{\sqrt{3}}$.

(iii) Finally, consider the case $\frac{1}{2} \leq y < \frac{b}{1-b}$. In this case, $D_d^1 \equiv \frac{b}{y} > 1 - b$, rendering internal financing unavailable in the second period. Hence, V_d^G is less than $1 - 2b$ (which is analogous to proposition 4). If $b < \frac{3-\sqrt{5}}{2}$ and $\theta > \frac{1-2b}{1-b}$ then, V_e^G would be larger than $1 - 2b$ (see the proof for the previous proposition), making pooling with d impossible. *End proof.*

8 References

Almieda, H., M. Campello, and M. Weisbach, 2002, "Corporate demand for liquidity," New-York university working paper.

Berkovitch, E., and M. Narayanan, 1993, "Timing of Investment and Financing Decisions in Imperfectly Competitive Financial Markets," *Journal of Business*, vol. 66, n. 2, 219-248.

Bester, H., 1985, "Screening vs rationing in credit markets with imperfect information," *American Economic Review*, 57, 850-855.

Bolton, P., and X. Freixas, 2000, "Equity, Bonds, and Bank Debt: Capital structure and Financial Market Equilibrium under Asymmetric Information," *Journal of Political Economy*, 108, 324-351.

Brick, I., M. Frierman, and Y. K. Kim, 1998, "Asymmetric information Concerning the Variance of Cash Flows: The Capital Structure Choice," *International Economic Review*, Vol. 39, n. 3 (Aug.), 745-761. .

Cai, J., and T. Loughran, 1998, "The Performance of Japanese seasoned equity offerings, 1971-1992," *Pacific-Basin Finance Journal*, 6, 395-426.

Cai, J., and K. Wei, 1997, "The investment and operating performance of Japanese initial public offerings," *Pacific-Basin Finance Journal*, 5, 389-417.

Chaplinsky, S., and G. Niehaus, 1993, "Do inside ownership and leverage share common determinants?," *Quarterly Journal of Business and Economics*, 32(4), 51-65.

Chemmanur, T., and P. Fulghieri, 1999, "A Theory of going -public decision," *The Review of Financial Studies*, Summer Vol. 12, n. 2, 249-279..

Cho, I. K., and D. Kreps, 1987, "Signalling Games and Stable Equilibria," *Quarterly Journal of Economics*, 102 (2), 179-221.

Choe H., R. Masulis, and V. Nanda, 1993, "Common stock offerings across the business cycle," *Journal of Empirical Finance*, 52, 1-29.

DeAngelo, H., L. DeAngelo, and D. Skinner, 1996, "Reversal of fortune: dividend signalling and the disappearance of sustained earnings growth," *Journal of Financial Economics*, 40, 341-371.

Diamond, D., 1991, "Monitoring and Reputation: the Choice between Bank Loans and Directly Placed Debt," *Journal of Political Economy*, vol.99, n. 4, 689-721.

Dittmar, A., J. Mahrt-Smith, and H. Servaes, 2003, "International Corporate Governance and Corporate Cash Holdings," *Journal of Financial and Quantitative Analysis*, Vol. 38, n. 1 (march), 111-133.

Dybvig, P., and J. Zender, 1991, "Capital Structure and Dividend Irrelevance with Asymmetric Information," *The Review of Financial Studies*, Volume 4, number 1, 201-219.

Easterbrook, F., 1984, "Two agency-cost explanation of Dividends," *American Economic Review*, Vol. 74 (4), 650-659.

Eckbo, B.E., R. Masulis, and O. Norli, 2000, "Seasoned public offerings: resolution of the 'new issues puzzle'," *Journal of Financial Economics*, 56, 251-291.

Eckbo, B.E., and O. Norli, 2001, "Leverage, liquidity and long-run IPO returns," working paper, Tuck School of Business, Dartmouth College, NH.

Fama, E., and K. French, 2002, "Testing Trade-off and Pecking Order Predictions about Dividends and Debt," *The Review of Financial Studies*, Vol. 15, n.1, 1-33.

Frank, M., and V. Goyal, 2002, "Testing the pecking order theory of capital structure," *Journal of Financial Economics*, Volume 67, Issue 2, February, 217-248.

Gertler, M., and S. Gilchrist, 1994, "Monetary Policy, Business Cycle and the Behavior of Small Manufacturing Firms," *Quarterly Journal of Economics*, Vol. 109, No. 2 (May), 309-340.

Gilson, S., K. John, and L. Lang, 1990, "Troubled debt restructurings: an empirical study of private reorganisation of firms in default," *Journal of Financial Economics*, 27, 315-353.

Goswami, G., T. Noe, and M. Rebbello, 1995, "Debt Financing under Asymmetric information," *The Journal of Finance*, vol. L., no. 2, June, 633-659.

Jain, B., and O. Kini, 1994, "The Post-Issue Operating Performance of IPO Firms," *The Journal of Finance*, vol. XLIX, n.5, December, 1699-1726.

Jensen, M. C., 1986, "Agency Cost of Free Cash-flow, Corporate Finance and Takeovers," *American Economic Review*, Vol. 76, n. 2, 323-329.

Jensen, M.C., and W.H. Meckling, 1976, "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," *Journal of Financial Economics*, 3, 305-360.

Kim, C.-S., D. Mauer, and A. Sherman, 1998, "The Determinants of Corporate Liquidity: Theory and Evidence," *Journal of Financial and Quantitative Analysis*, Vol. 33, n. 3, September, 335-359.

Korajczyk, R., and A. Levy, 2003, "Capital structure choice: macroeconomic conditions and financial constraints," *Journal of Financial Economics*, Vol. 68, Issue 1,....

Kreps, D. M., and R. Wilson, 1982, "Sequential equilibria," *Econometrica*, vol. 50, n.4, July, 863-894.

Lang, L., and R. Litzenger, 1989, "Dividend announcements: cash flow signalling vs. free cash flow hypothesis?," *Journal of Financial Economics*, 24, 181-191, North-Holland.

- Levy, A., 2000, "Why Does Capital Structure choice Vary With Macroeconomic Conditions," working paper, Stern School of Economics, New-York University.
- Loughran, T., and J. Ritter, 1997, "The operating performance of Firms Conducting Seasoned Equity Offerings," *Journal of Finance*, Vol. 52, No. 5, Dec., 1823-1850.
- Lowry, M., 2003, "Why does IPO volume fluctuate so much?," *Journal of Financial Economics*, 67, 3-40.
- Lucas, D., and R. McDonald, 1990, "Equity issues and stock price dynamics," *Journal of Finance*, 45, 1019-1043.
- Masulis, R., and A. Korwar, 1986, "Seasoned equity offerings: An empirical investigation," *Journal of Financial Economics*, 15, 91-118.
- Mickelson, W., and M. Partch., 1986, "Valuation effects of security offerings and the issuance process," *Journal of Financial Economics*, 15, 31-60.
- Mickelson, W., M. Partch, and K. Shah, 1997, "Ownership and operating performance of companies that go public," *Journal of Financial Economics*, 44, 281-307.
- Myers, S.C., and N.S. Majluf, 1984, "Corporate Financing and Investment Decisions When Firms Have Information That Investors Do not have," *Journal of Financial Economics*, 13(2), June, 187-221.
- Myers, S., and L. Shayam-Sunders, 1999, "Testing static trade-off against pecking-order models of capital structure", *Journal of Financial Economics*, Volume 19, Issue 2, February, 219-244.
- Nachman, D. C., and T. H. Noe, 1994, "Optimal Design of Securities under Asymmetric information," *The Review of Financial Studies*, Spring, Vol. 7, No. 1, 1-44.
- Neher, D., 1999, "Stage financing: an agency perspective," *The Review of Economic Studies*, 66, 255-274.
- Noe, T., and M. Rebello, 1996, "Asymmetric Information, Managerial Opportunism, Financing, and Payout Policies," *The Journal of Finance*, Vol. 51, No. 2 (June), 637-660.
- Opler.
- Pagano, M., F. Panetta, and L. Zingales, 1995, "Why Do Companies Go Public? An Empirical Analysis," NBER working paper N. 5367.
- Purnanandam, A., and B. Swaminathian. "Are IPOs underpriced?". Cornell University, working paper.
- Rajan, R. G., and L. Zingales, 1995, "What do we know about capital structure? Some evidence from international data," *Journal of Finance*, 50, 1421-1460.
- Ravid, S., and O. Sarig, 1991, "Financial Signalling by Committing to Cash Outflows," *The Journal of Financial and Quantitative Analysis*, Vol. 26, No. 2, pp. 165-180.
- Ritter, J., and I. Welch, 2002, "A review of IPO activity, pricing and allocations," *The Journal of Finance*, Vol. 57, Issue 4, 1795-1828.

Titman, S., and R. Wessels, 1988, "The Determinants of Capital Structure Choice," *Journal of Finance*, 43, 1-19.

Viswanath, P.V., 1993, "Strategic Considerations, the Pecking Order Hypothesis, and Market Reactions to Equity Financing," *Journal of Financial and Quantitative Analysis*, Vol. 28, n. 2., June, 213-234

Wagner, W., 2002, "Divestment, entrepreneurial incentives and the decision to go public," discussion paper 2002-47, Center for Economic Research, Tilburg University, N.

Webb, D.,1991, "Long-term financial contracts can mitigate the adverse selection problem in project financing," *International Economic Review*, Vol.32, n. 2, May, 305-320.

Footnotes

¹Myers and Majluf (1984) refer to lognormal profit distribution function in their conclusions. Nachman and Noe (1994) further refine this by allowing for a large class of functions. In equilibrium, all types of firms prefer debt to equity.

²See Levy (2000), Ritter and Welch (2002), Korajczyk and Levy (2003) and Lowry (2003). See also Viswanath (1993), who argues that equity issues positively correlate with the extent of current asymmetric information (and negatively correlate with future asymmetric information).

³I will discuss other asymmetric information theories of procyclical equity issue phenomena (like Lucas and McDonald's (1990) and Berkovitch and Narayanan's (1993)) further in the introduction.

⁴See Loughran and Ritter (1997) and Ritter and Welsch (2002) for similar reflections.

⁵Viswanath's (1993) two-period extension of Myers and Majluf's model does not confirm that high-profitable firms never issue equity.

⁶Some economists refer to Leland and Pyle's (1977) explanation for long-term afterissuing underperformance of firms issuing equity, which is also based on an asymmetric information approach. We will discuss the differences between our two explanations later.

⁷For a similar analysis see, for instance, Viswanath (1992).

⁸This information structure is similar to Bolton and Freixas' (2000) where managers of firms issuing securities have certain information on the firm's profits for the first and second period after issue. This is also similar to the life cycle theory in IPO decisions (see, e.g., Chemmanur and Fulghieri (1999) or Wagner (2002)), since managers have more information than the public does about a firm's cycle phases, which in many aspects is long-term information. See also Goswami, Noe and Rebello (1995) who provide examples of situations when the long-term private manager's knowledge is reasonable.

⁹Note that there exists a large amount of literature arguing why stage financing could be optimal compared to up-front financing (e.g. Neher, 1998).

¹⁰The interpretation of business cycle in Viswanath's paper is based on a certain hypothesis about the link between interest rates and business cycle.

¹¹One notable exception is Brick, Frierman and Kim (1998) where firms' profits have the same average value but different variances. This paper does obtain some results about firm dividend policy.

¹²This basic idea, however, should be qualified by taking into account who controls the firm and whether or not investment opportunities are non-

correlated with the amount of cash. When the manager has control, he will probably avoid a debt increase, given the high free cash accumulation.

¹³In actuality, this responsibility can be delegated to Directors' Boards or even to shareholder meetings representing the interests of shareholders.

¹⁴More complicated securities are not considered here since the model's implications are all about equity-debt choice. Also, for the simplicity of exposition, I assume that only pure strategies can be played, although this is not crucial to the results.

¹⁵Up-front financing with debt makes no sense because debt is short-term by assumption.

¹⁶This is based on Myers and Majluf's (1984) idea that in one-period setting under asymmetric information, equity is never issued. Although our environments are quite different, one can show that the introduction of the possibility of equity issue in the second period does not alter any results.

¹⁷To simplify, I assume that mixed financing (debt/equity in the first period or cash/debt in the second) is not possible. The basic intuitions developed within this paper are not affected by introducing these possibilities. It is also important to note that the model can be extended by allowing mixed strategies (in game-theoretic terms), which can be interpreted to some extent as real mixed financing.

¹⁸Easterbrook (1984), Jensen (1986). See also Lang and Litzenberger (1989) and Dittmar, Mahrt-Smith and Servaes (2003) for empirical analysis about the significance of manager's agency cost in holding cash.

¹⁹I assume free cash to be any available cash at the end of a period, which means any resources that were not invested during the period or any received profits that were not used for interests or dividends.

²⁰Another situation when default automatically triggers bankruptcy—which in turn triggers complete termination of the firm's activity—is also possible. Even though one could show that this does not destroy the paper's result, this construction of debt would be unnatural in our case because it implies additional cost on debt financing, even in the context of symmetric information. In actuality, both situations are empirically observable (see, for example, Gilson, John and Lang (1990)).

²¹For an example of the role of collateral in solving adverse selection problems on the credit market see Bester (1985).

²²The same holds true if one introduces the cost of free cash holding by keeping symmetric information about firm type. While dividend policy becomes relevant, capital structure does not matter in this situation.

²³Dybvig and Zender (1991) show that the problem of under investment in Myers and Majluf (1984) can be avoided if the contract between shareholders and manager is endogenous as opposed to assuming that the manager acts on behalf of the initial owners. In my paper (like, for example, in Nachman and Noe (1984)), this problem is avoided because the primary topic is capital structure choice and not the problem of inefficient investment. In other words, the investment policy is always efficient.

²⁴Hence, equity issue here is more private than public (IPO). For an analysis of the situation when manager ownership is large enough, but renegotiation between manager and shareholders is not possible, see section 6.

²⁵Other considerations are also possible.

²⁶When talking about the problem of first-period profit distribution, we assume that it is equal to 1.

²⁷This cannot be lower because it can be easily shown that even with this price the payoff for outsiders is greater than b .

²⁸The case $b < 1/5$ is not very interesting—even if information is symmetric, up-front financing cannot provide first-best for type S making capital structure relevant.

²⁹Similar conclusions were found for the LBO reverse (a particular case of IPO). See, for example, Degeorge and Zeckhauser (1993).

³⁰Actually, my model does not prescribe that afterissuing underperformance is positively correlated with lower entrepreneurial ownership because these results are consistent for firms with low managerial part (public firms) as well as for firms with high managerial part (private firms). Note that the empirical findings about this are different: Jain and Kini (1994) confirm the positive relationship between the agent's part and afterissuing underperformance, while Pagano et al (1995), Cai and Loughran (1998) and Mickelson et al (1997) do not.

³¹The basic model analyzed previously is a particular case, with $\theta_i < 1/2$ and $\theta_j = 1 - \theta_i$.

³²Note that, in the case of public firms, it can be analytically shown that: 1) In any two-strategy equilibrium, there exists $\theta^* \in (b, 1 - b)$ such that firms with $\theta > \theta^*$ issue equity and firms with $\theta < \theta^*$ issue debt; 2) If $y \leq 1/2$ (non-declining economy), this equilibrium exists; 3) If and only if $y > 1/2$, pooling with debt is an equilibrium; 4) Mispricing is larger under pooling with equity than under other equilibriums. Theoretically, for private firms, the choice of equilibrium is not evident. However, numerical analysis shows that separating equilibrium almost always exists. An exception is the

situation: $1/3 < b < (3 - \sqrt{5})/2$, which confirms the results of propositions 6 and 7.

³³Where $C = \frac{\gamma}{e^{-\gamma b} - e^{-\gamma(1-b)}}$. C is a constant that allows us to keep the cumulative probability equal to 1.

³⁴Many others, using a variety of perspectives, have attempted explanations of long-term afterissuing underperformance. It is interesting to note that while the basic intuitions were developed about thirty years ago, the theory here is far from anonymous. For example, Ritter and Welch (2002) characterize long run performance (note that when speaking about long run performance, Ritter and Welch (2002) incorporate all aspects of this problem and not specifically the afterissuing underperformance of firms issuing equity, although this aspect is also a part of their analysis) as the most controversial area of IPO research, whereas some research protects the efficient market point of view and still others argue in favor of a behavioral point of view. Among basic rational market intuitions, the following classic papers are notable. Jensen and Meckling (1976) pointed out the idea that equity issue decreases the manager's stake in the company's equity and reduces the incentive to undertake value maximizing projects, which determine afterissuing underperformance. Leland and Pyle (1977) argued that by issuing debt, managers can signal the high quality of a project that is known only by them. The present paper is different from the above cited articles in some important ways: first, both of these broadly cited papers consider only one-period security issue models and thus they cannot be interpreted with certainty as the basis for long-term afterissuing underperformance of firms issuing equity; second, these papers do not explain some important characteristics of IPO firms such as the best performance of these firms in the time of issue; and third, they not only link equity issue and the low performance of firms but they link this phenomena to the lower entrepreneurial part in equity capital, which is empirically controversial, as was noted above.

³⁵Note that the existing research about long-term afterissuing operating performance of firms issuing equity does not separately analyze different phases of business cycles.

³⁶Similar theories on this last topic are developed by Levy (2000), who shows the difference in issuing activities with regards to business cycle between financially constrained and non-constrained firms. Gertler and Gilchrist (1994) analyze the differences in cyclical behavior of credit demand between small and large firms.

³⁷Note that the same result holds true if one introduces the possibility for

second-period outsiders to observe first-period profit realization, given that market beliefs are Bayesian.

Table 1. Business cycle and capital structure.

The density of types is $f(\theta) = C \exp(-\gamma\theta)$ where θ is the expected profit in the first period. y is the average first-period profit in the economy. High y corresponds to a stagnating economy (low second period profit) and a low y indicates a growing economy. In cases a) and b), theoretically possible equilibrium are: separating, pooling with debt or pooling with equity. If several equilibriums exist, the one with minimal mispricing is chosen. Likewise in c) and d), where the spectrum of possible equilibrium is much larger. In cases a), b) and c), if equilibrium is separating, firms with $\theta < \theta^*$ issue debt and firms with $\theta > \theta^*$ issue equity. In d), firms with $\theta > \theta^*$ issue equity up-front.

a) *Public firms. $b = 0.4$*

γ	< 0	0	2	4	6	8	10	20
y	> 0.5	0.5000	0.4934	0.4868	0.4805	0.4744	0.4687	0.4463
$(1 - y)/y$, economy rate of growth	< 1	1.0000	1.0270	1.0542	1.0813	1.1079	1.1336	1.2408
equilibrium type	pooling with debt	separating						
θ^*	-	0.5999	0.5594	0.5396	0.5297	0.5198	0.5099	0.4703
$1 - F(\theta^*)$, proportion of firms, issuing equity	0.0	0.0005	0.1720	0.2230	0.2262	0.2276	0.2288	0.2310

b) *Public firms. $b = 0.25$*

γ	< 0	0	2	4	6	8	10	20
y	> 0.5	0.5000	0.4590	0.4217	0.3905	0.3657	0.3466	0.3000
$(1 - y)/y$, economy rate of growth	< 1	1.0000	1.1786	1.3711	1.5610	1.7347	1.8851	2.3336
equilibrium type	pooling with debt	separating						
θ^*	-	0.7499	0.5750	0.4875	0.4250	0.3750	0.3376	0.2876
$1 - F(\theta^*)$, proportion of firms, issuing equity	0.0	0.0002	0.2439	0.2907	0.3158	0.3559	0.4126	0.4715

c) *Private firms. $b = 0.4$*

γ	-16	-12	-8	-4	0	4	8	12	16
y	0.5460	0.5366	0.5256	0.5132	0.5000	0.4868	0.4744	0.4634	0.4540
$(1 - y)/y$, economy rate of growth	0.8315	0.8636	0.9026	0.9485	1.0000	1.0542	1.1079	1.1580	1.2408
equilibrium type	separating								
θ^*	0.5874	0.5675	0.5500	0.5300	0.5150	0.5000	0.4850	0.4775	0.4675
$1 - F(\theta^*)$, proportion of firms, issuing equity	0.1900	0.3550	0.4140	0.4437	0.4250	0.4013	0.3817	0.3340	0.3113

d) *Private firms. $b = 0.25$*

γ	-20	-12	-8	-4	0	4	8	12	20
y	0.7000	0.6679	0.6343	0.5783	0.5000	0.4217	0.3657	0.3321	0.3000
$(1 - y)/y$, economy rate of growth	0.4285	0.4972	0.5765	0.7293	1.0000	1.3711	1.7347	2.0112	2.3336
equilibrium type	separating								
θ^*	0.3000	0.2900	0.2900	0.2850	0.2800	0.2675	0.2600	0.2575	0.2650
$1 - F(\theta^*)$, proportion of firms, issuing equity	0.9999	0.9985	0.9930	0.9765	0.9399	0.9218	0.9217	0.9137	0.7408