ORDER OF PREFERENCE OF DEBTS UNDER ASYMMETRIC INFORMATION

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Abstract

The purpose of this article is to investigate the debt hierarchy adopted by French companies in the context of asymmetric information. In other words, we identify the hierarchy between the three most used forms of debt that best describes the debt behaviors of French companies. The study relies on the ordered probit regression to identify the hierarchy that best describes the debt behaviors of a sample of 121 non-financial firms listed on the Euronext Paris stock exchange. Next, we perform panel-data regressions to investigate the impact of the financial crisis on debt behaviors. The empirical results show that French companies listed on the SBF 250 follow the hierarchy {Bank debt, Bond debt, Convertible bonds}. This hierarchy is explained primarily by asymmetric information. Other variables that explain the adoption of this hierarchy include the size, default risk, deficit and R&D expenditures of the company. At a time of crisis, despite the strong asymmetric information, the debt hierarchy is modified. To the best of our knowledge, this article constitutes the first study that addresses the existence of a hierarchy between three types of debt: bank debt, bond debt, and convertible bonds. Hence, it extends the previous research on capital structure and provides new managerial insights.

Keywords: Asymmetric Information, Bank Debt, Bonds, Convertible Bonds, Hierarchy Of Debt

1. INTRODUCTION

Several studies have investigated the choice between debt financing and equity financing. However, the choice between different categories of debts has not been thoroughly characterized to date. Debt comes in several forms, including bank debt (BaD), bond debt (BoD), convertible bonds (CB), mandatory convertible bonds, bonds with redeemable share subscription warrants, and bonds with bond warrants. To date, only the choice between bank debt and bond debt has generated interest among researchers.

In this study, we explore the three forms of debt most commonly used by SBF 250 companies: bank debt, bond debt, and convertible bonds. We have checked the issuance statistics of the various debt forms in the annual reports of the Financial Markets Authority.

In the context of asymmetric information, we can indicate the order of preference of companies with respect to these three types of debt. We question whether there is a primacy of the bank debt with regard to the bond debt and convertible bonds.

Thus, this article constitutes the first study that addresses the existence of a hierarchy between these three types of debt.

As the basis of our study, we applied the pecking order theory of Myers and Majluf (1984). This theory enables us to investigate the informational asymmetries and to compare our results with those of previous studies.

In this research, we implicitly assume that the issuance of shares is placed at the bottom of the financial hierarchy and that self-financing is a privileged form of financing for businesses.

The purpose of this article is to investigate and identify the determinants of the debt hierarchy

adopted by companies in the context of asymmetric information.

Next, we raise the following two questions:

1- In the context of asymmetric information, what is the hierarchy that best describes the debt behaviors of French companies?

2- What are the variables likely to influence the choice of this hierarchy?

The remainder of this article is organized as follows. Section 2 presents the literature reviews and the hypotheses underlying the study. Section 3 describes the empirical approach. Section 4 reports and discusses the primary results, and section 5 concludes and suggests some implications of the research, alongside further research.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Based on the existence of asymmetric information between investors and managers who act in the interests of existing shareholders, Myers and Majluf (1984) suggested that the choice of the financing method is defined according to a specific order, and we refer to this concept as the pecking order theory. Managers prefer internal financing to the detriment of external financing. In the case of external financing, managers place a high priority on indebtedness at the expense of the issuance of shares.

Our article forms an extension of the pecking order theory. In this study, we adopt the financing order of Myers and Majluf (1984) and elaborate on it by taking into account three types of debt: bank debt, bond debt and convertible bonds.

Based on the asymmetric information hypothesis, we identify and study the determinants of the hierarchy of these three types of debt.

2.1 Asymmetric information

The importance of debt is mainly perceived as a means to solve the inherent problems of asymmetric information and to restrict managerial discretion over the use of free cash flow (Dockery *et al.*, 2012).

The primacy of the bank debt is explained by certain characteristics specific to this type of debt, such as the multitude of bank contracts, their expertise in gathering information and monitoring their borrowers (Guigou and Vilanova, 1999, De Bodt *et al.*, 2005) and the relational characteristic of the bank debt. Thus, the close client relationship between the bank and the company it finances ensures information exchange between both sides and reveals the quality of the projects.

Unlike bank debt, bond debt is contracted with many dispersed investors who provide little incentive for the collection of information on the company they finance. This approach maximizes the existing shareholders' wealth while minimizing the possibility of sharing the benefits arising from the project with the external investors.

Nonetheless, the bond-financing regime can be viewed as a means of transferring the risk that the companies are not eager to bear to investors (Praquin, 2007). Investors may interpret this financing choice as a signal of poor quality projects.

Furthermore, bond debt is usually preferred over convertible bonds. In the context of asymmetric information, these are considered as disguised share issues and negative signals that will be transmitted to the market (Loncarski *et al.*, 2008). Furthermore, convertible bonds financing implies an advantage for the investors. The conversion option enjoyed by the holders of convertible bonds enables them, if successful, to share the benefits with the project owners and to protect themselves in case of failure. In this respect, the managers who act in the best interests of the existing shareholders will use this option as a last resort.

Hence, we present the following hypothesis:

Hypothesis 1: Companies with sharp asymmetric information choose the hierarchy {BaD, BoD, CB}. They choose the bank debt (BaD) first, the bond debt (BoD) second and the convertible bond (CB) last.

The literature on the financing choice also enabled us to define other characteristics of the borrowers and could explain the choice of a hierarchy within debt financing.

2.2 The size of the company

The size of the company has an influence on the debt decision. Kremp and Stöss (2001) believed that large companies are less likely to be in debt. They justify this by the easy access of these companies to the international financial markets. By contrast, other researchers (Molina, 2005, Abor and Biekpe, 2007) highlight the positive relationship between the size and bank debt.

Regarding bond debt, it is more accessible for large companies rather than for small ones.

To be provided access to the bond market, small companies prefer the classic bond debt to the convertible one. These companies are generally family-owned and avoid financing by convertible bonds because it may lead to the dilution of the ownership.

We are testing the idea that small companies choose the hierarchy {Bank debt, Bond debt, Convertible bond} since they are the most concerned with asymmetric information.

Hypothesis 2: The larger the company, the more likely it is to choose the hierarchy {BaD, BoD, CB}.

2.3 The risk of default

Bank debt is less accessible for risky companies. Banks, through their expertise concerning information gathering, are able to perceive the companies' level of risk, which makes them less willing to lend funds (Mazur, 2007). Risky companies tend to turn towards the stock market (Helwege and Liang, 1996) or the bond market (Lobez and Statnik, 2007). Bond debt allows risky companies to transfer their risk to external investors. However, the convertible bond financing is less risk sensitive, since the holders of these securities can transform them into shares in cases of high levels of risk.

Therefore, we assume the following hypothesis:

Hypothesis 3: The higher the risk of default, the less the hierarchy {BaD, BoD, CB} is chosen.

2.4 The tangibility of assets

The company's tangible assets constitute collateral value for banks. Tangibility is positively related to a

company's indebtedness (Chevallier and Miloudi, 2014). Lin (2016) shows that an increase in collateral value leads to an increase in bank debt. Companies that have significant tangible assets can obtain loans on more favorable terms. Regarding the companies holding few tangible assets, they may resort to bond debt because it would be difficult to obtain bank debt without proper guarantees. Furthermore, the tangible assets are inversely related to the potential transfer of wealth and thus to the risk of asset substitution. Consequently, companies with few tangible assets would tend to issue convertible bonds.

This can be explained by the fact that convertible bonds constitute a privileged way to limit the problem of asset substitution (Marszalek, 2015).

Therefore, we consider the following hypothesis:

Hypothesis 4: The more tangible assets a company has, the more the hierarchy {BaD, BoD, CB} is chosen.

2.5 The funding deficit

According to the pecking order theory, companies restrict their need for external financing through self-financing. They prefer self-financing over external financing, and in the case where their self-financing is exhausted, they prefer indebtedness through share issues. By contrast, Frank and Goyal (2003) stated that the deficit is better filled by share issues than by debt issues. This is attributable to the fact that banks are less willing to address high risk. In this regard, companies with an important deficit may fail to obtain the requested amount in the form of bank debt. They anticipate the possibility of credit rationing and prefer shifting towards the bond market.

Therefore, we propose the following hypothesis:

Hypothesis 5: The greater a company's losses, the less the hierarchy {BaD, BoD, CB} is chosen.

2.6 Research and Development expenditures (R&D)

Researchers highlight a negative relationship between R&D intensity and indebtedness (Myers, 1977, Belin *et al*, 2012). The confidentiality of the information explains this relationship. Companies with high R&D can choose the bank debt in order to avoid spreading information about their R&D level into the markets. Yosha (1995), Bhattacharya and Chiesa (1995) and Von Rheinbaben and Ruckes (2004) demonstrated that companies prefer bilateral financing (bank debt) over multilateral financing (bond debt).

Bond financing obtained from a large number of investors involves a wide disclosure of information that is not in the interests of companies engaged in an R&D activity.

Our last hypothesis is as follows:

Hypothesis 6: The more a company is engaged in R&D activity, the more the hierarchy {BaD, BoD, CB} is chosen.

3. EMPIRICAL APPROACH

3.1. Data and methodology

Our study focuses on SBF 250 companies. Our choice of these companies is intended to facilitate future comparisons of our results with previous ones. We have excluded 32 financial institutions from our initial sample. These institutions are known for their atypical capital structures due to the regulations to which they are subjected. Another 97 companies were removed from the sample due to the absence of the necessary data. The final sample includes 121 companies over the period from 2008 to 2012.

The debt data were calculated on the basis of balance sheets extracted from the Orbis database. The accounting and financial data were collected from various sources such as Thomson One Banker, Datastream, and the annual reports for the companies.

The sampled companies are from 13 sectors of activity and operate mainly in the sectors of technology and industrial goods and services.

Table 1 shows the distribution of our sample by sector of activity.

Table 1. Distribution of firms by sector of activity

Sector of Activity	BaD	%	BoD	%	CB Sample	%
Food and Beverage Industry	2	4,26%	2	3,70%	0	0,00%
Automotive and Equipment	3	6,38%	1	1,85%	0	0,00%
Building and Construction	3	6,38%	3	5,56%	3	15,00%
Industrial Goods and Services	5	10,64%	11	20,37%	0	0,00%
Chemistry	2	4,26%	0	0,00%	1	5,00%
Distribution	1	2,13%	2	3,70%	2	10,00%
Raw Materials	1	2,13%	4	7,41%	1	5,00%
Media	3	6,38%	1	1,85%	2	10,00%
Oil and Gas	2	4,26%	3	5,56%	1	5,00%
Personal and Household Goods	0	0,00%	2	3,70%	1	5,00%
Health	5	10,64%	2	3,70%	0	0,00%
Technology	17	36,17%	18	33,33%	5	25,00%
Telecommunications	3	6,38%	5	9,26%	4	20,00%
Total	47	100,00%	54	100,00%	20	100,00%

Note: These sectors are defined by the sectoral classification made by Euronext

Companies belonging to the sectors of technology and industrial goods and services represent 47,11% of the total sample, which constitutes in itself 46,81% of the sampled companies that used bank debt, 53,7% of those that issued bond debt, and 25% of those that chose convertible bonds as a means of financing.

From a methodological perspective, we first apply a univariate analysis to describe the French companies' characteristics based on their indebtedness choice. After that step, we conduct an ordered probit regression and panel-data regressions.

3.2. Variables

We study three categories of debt: bank debt (BaD), bond debt (BoD), and convertible bonds (CB). The variable to be explained in the Ordered Probit Model is the adoption of a debt hierarchy. We have identified six possible hierarchies: {BaD, BoD, CB}; {BaD, CB, BoD}; {BoD, CB, BaD}; {BoD, BaD, CB}, {CB, BaD, BoD},

and {CB, BoD, BaD}. The first two hierarchies favor bank debt over the other two debts. The third and fourth hierarchies give priority to bond debt. The last two hierarchies are in favor of convertible bonds.

Therefore, the dependent variable is a qualitative variable that takes into consideration the three modalities arranged according to an order. The three endogenous variables (BaD, BoD, and CB) are constructed variables. They are defined according to the net increase in their values as stated on every firm's balance sheet. We consider "having issued a debt" as any company in which the changes in its long-term debt from one year to another exceeded 5% of total assets.

Concerning the linear regression on the panel data, the dependent variable is metric. It corresponds to the variations in the amounts of the three modalities of indebtedness from one year to the next.

Table 2 reports the measures of the explanatory variables.

Table 2. Variable definition

	Variable	Proxy used
AI	Asymmetric information	Annual average of the daily bid-ask spread
RD	Risk of default	"1- Solvency ratio"
SIZE	Size of company	Logarithm of total assets
TANG	Tangibility of assets	Tangible assets/total assets
DEF	Deficit	$DEF_t = INVEST_t + DIV_t + \Delta BFR_t - CAF_t$ *Where: INV$_t$: capital expenditures; DIVt: dividend payments; ΔBFRt: net increase in working capital; and CAF$_t$: operating cash flows, after interest and taxes.*
R&D	Research and development	R&D/sales

4. RESULTS

4.1 Results of the univariate analysis

Table 3. Firm characteristics by debt choice

Variables	Bank debt	Bond debt	Convertible bond	Average difference
AI (%)	2,93	1,41	2,16	2,56**
	(1,88)	(0,72)	(0,93)	
RD	0,72	0,67	0,82	4,15***
	(0,69)	(0,72)	(0,76)	
SIZE	6,72	6,99	9,54	18,60***
	(5,99)	(6,75)	(8,94)	
TANG	0,41	0,45	0,38	0,499
	(0,36)	(0,44)	(0,36)	
DEF	90,12	-170,01	-150	4,74***
	(-9,69)	(-25,04)	(-52,53)	
R&D	20,34	12,18	4,31	12,17*
	(10,41)	(6,39)	(2,40)	

Notes: The medians are in parentheses.

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 3 shows that according to the kind of debt chosen, French companies differ on several characteristics. Bank debt issuers have sharp

asymmetric information and are the smaller companies. Bank debt is requested by the companies with sharp asymmetric information with the goal of

reducing the inherent costs. As explained by Guigou and Vilanova (1999) and De Bodt *et al.* (2005), banks are known for their expertise in gathering information on their clients. The small size of the companies that use bank debt is justified by their difficulty in accessing the bond market and by the asymmetric information. The results agree with those of Kremp and Stöss (2001).

The average risk level (0,72) of the companies issuing bank debt is slightly higher than that of companies issuing bond debt (0,67). It remains significantly lower than that of the companies that use convertible bonds (0,82). The risky companies prefer convertible bond financing over the other types of debt. Convertible bond debt is in fact the least risk-sensitive type of debt, since the bond investors can convert their bonds into shares in the case of high risk.

The asset tangibility variable has no significant effect on the choice of indebtedness.

Concerning the deficit, the tests show that the biggest loss-making companies favor bank debt. This result is consistent with the finding of the pecking order theory that estimates that indebtedness remains the favorite financing means for companies whose self-financing capacities are exhausted.

The results also show that on average, companies that use bank debt have higher R&D expenditures than those financed by bond debt (conventional and convertible debt). This finding is observed because companies with high R&D spending prefer to use bank debt to avoid spreading information about their R&D level into the markets. These results confirm those of Yosha (1995), Bhattacharya and Chiesa (1995) and Von Rheinbaben and Ruckes (2004).

4.2. Results of the ordered probit model

We have six possible hierarchies. Each hierarchy has an opposite. Therefore, the coefficients in each of the ordered probit models associated with them will be equal in absolute values but have opposite signs. Hence, it is sufficient to test only three ordered probit models that correspond to the different possible hierarchies:
- {BaD, BoD, CB} denominated by the discrete values {0, 1, 2};
- {BaD, CB, BoD} denominated by the discrete values {0, 2, 1};
- {BoD, BaD, CB} denominated by the discrete values {1, 0, 2}.

The results are summarized in Table 4.

Table 4. Results of the ordered probit regression

Variables	{BaD, BoD, CB}	{BaD, CB, BoD}	{BoD, BaD, CB}
AI (%)	$1,25\ 10^{-3***}$	7,46	$0,42\ 10^{-3}$
	(2,57)	(1,31)	(0,67)
SIZE	0,65***	0,16**	0,07
	(5,67)	(3,26)	(1,61)
RD	-1,69**	-1,92**	0,87*
	(-1,48)	(-2,30)	(1,16)
TANG	0,33	0,52	-0,55
	(0,73)	(1,22)	(-1,33)
Deficit	$-0,18\ 10^{-3*}$	$-5,93\ 10^{-6}$	$-0,45\ 10^{-4}$
	(-1,85)	(-0,16)	(-0,78)
R&D	0,35*	0,10*	0,03
	(2,61)	(1,14)	(1,21)
Log Likelihood	-141,01	-167	-160,5
Pseudo R^2	16,05%	3,02%	4,91%
Wald Chi-square	54,48***	12,30*	14,50**
N	153	153	153
Rank	1	3	2

Notes: For each explanatory variable, the value of the regression coefficient is followed by (in parentheses) the value of the Wald statistic(z).

***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

The results indicate that the hierarchy {BaD, BoD, CB} best describes the preferences of the companies in our sample. The Log Likelihood, the Pseudo R^2 and the Wald Chi-square of this hierarchy are statistically superior to the other two debt-tested hierarchies.

The relationship between asymmetric information and the debt hierarchy {BoD, BaD, CB} is positive and significant at the 1% level. The effect of asymmetric information on the other two hierarchies studied is not significant.

The positive influence of asymmetric information on the choice of the first hierarchy is explained by the disciplinary role of bank debt towards the managers. Banks have an informational advantage in terms of control and firm valuation. The granting of bank debt for a company indicates its good quality. The use of bond debt solves less of the problems inherent in asymmetric information. It is the transactional financing obtained from many investors who have little information on the company they finance.

In the context of asymmetric information, managers who act in the interest of the existing shareholders choose convertible bonds as a last resort. This finding is observed because these securities give their holders the opportunity to share the profits of their project with the shareholders through the conversion option.

This finding supports hypothesis H1. The choice of the hierarchy {BoD, BaD, CB} makes it possible to remove the uncertainties inherent in asymmetric information in accordance with the statements of Myers and Majluf (1984).

The hypothesis H2 related to the size variable has not been confirmed. Large companies prefer bank debt over bond debt and convertible bonds. This can be explained by the ability of large companies to offer guarantees to their creditors and therefore facilitate the granting of a bank financing.

The risk impact is negative and significant on the choice of the hierarchy {BaD, BoD, CB}, in accordance with hypothesis H3. High-risk companies use less bank debt because banks are less inclined to lend them funds (Mazur, 2007).

We also observe that firms with the lowest deficit are most likely to choose the first hierarchy, confirming H5. In fact, a small deficit is easily filled by bank debt. When the amount to be raised is too high, it is difficult to obtain it from banks which are less willing to address high risk as pointed out by Frank and Goyal (2003).

The results emphasize that firms with significant R&D expenditures tend to choose the hierarchy {BaD, BoD, CB} which is consistent with our hypothesis H6. Companies with a high level of R&D choose the bank debt to avoid spreading information about their R&D.

The tangibility of the assets has no significant effect on the choice of this hierarchy. H4 was not confirmed.

The results of this study corroborate the pecking order theory concerning the primacy of bank debt over bonds and convertible bonds. The hierarchy of financing sources can be explained by asymmetric information between managers and investors. The choice of bank debt first disciplines managers and entices them to act in the interest of their existing shareholders. Compared to convertible bonds, bond debt avoids the dispossession of the existent shareholders in favor of new investors. The conversion option related to bonds gives investors the right to access capital and to share the profits of new projects with their existing shareholders.

4.3. Impact of the financial crisis on debt behavior

In a crisis context, the asymmetric information is accentuated. This should reinforce the choice of the hierarchy {BaD, BoD, CB}.

Table 5 shows the results of panel-data regressions.

Table 5. Results of panel-data regressions

Variables	Variation of Bank Debt (FE)	Variation of Bond Debt (CE)	Variation of Convertible Bonds (CE)
AI (%)	1,75**	0,75*	0,48
RD	-21,06*	12,15	11,2
SIZE	-12,26*	18,32	2,15
TANG	22,07*	30,8	11,86
Deficit	11,5	6,38	11,59
R&D	4,30*	3,67	2,54
Year 2008	-5,75**	-4,22*	-3,75*
Year 2009	-6,78*	2,87*	3,68*
Year 2010	2,15*	-2,45	-6,08
Year 2011	8,22*	-8,92	-4,76
Year 2012	-0,95*	-6,22	-1,67
Constant	-5,78	-3,69	-1,14
Fisher Test	1,18*	1,25*	1,78***
Lagrange Multiplier	1,42	0,87	0,73
Hausman Statistic	18,67***	10,52	5,9
Temporal Effects Test	4,25**	2,37**	1,11*
R² within	25,24%	18,25%	25,59%
R² adjusted	45,10%	27,98%	26,53%
F	4,73%	3,45%	5,52%
N	508	508	508

Notes: Modeling heterogeneity between companies is carried out by the models with fixed effects(FE) or by compound errors(CE).
****, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.
The variations of bank debt, bond debt and convertible bonds correspond to the variations in the amounts of these three modalities of indebtedness from one year to the next.

The asymmetric information has a positive and significant effect on the bank and bond financing. However, the influence is greater on bank debt. This result corroborates the first part of the study. Companies with high asymmetric information favor bank debt over conventional and convertible bonds. This result is valid if we assume a stable debt behavior over time. Taking into account temporal specificities leads to different conclusions.

The coefficients of the "Year i" variables (i = 2008 to 2012) are significant. This result leads us to conclude that the adoption of the debt hierarchy is very sensitive to the period of study.

In 2008, at the beginning of the financial crisis, financing by the three studied categories of debts failed. The year 2009 was characterized by a low level of financing through bank debt and by significant fundraising through bonds (conventional and convertible bonds). From the year 2010, we start noticing a gradual use of bank debt. An explanation for this result could be linked to the long-term refinancing operations established by the European Central Bank in June and December 2009.

The purpose of these operations is to enable banks to lend more to companies by giving them long repayment terms and very low rates. In 2011, the financing by bank debt continued to grow at the expense of the conventional and the convertible bonds. The year 2012 was marked by a downward trend. This can be explained by the measures taken by the European Central Bank in 2011 (an increase in the key interest rate of 0,25 basis points to 1,25%).

In the context of crisis, the study shows that the previously determined debt hierarchy {BaD, BoD, CB} is not used by our sample firms. They prefer bond financing to bank debt. This choice is due to the market instability.

We conducted a separate study to check the robustness of our results by considering internal financing. The results, available upon request, are the same even after taking into account the internal financing.

5. CONCLUSIONS

By considering three types of debt (Bank debt, Bond debt and Convertible bonds), we identified the preferred debt hierarchy of firms in the context of asymmetric information.

The results reveal that French companies listed on the SBF 250 follow the hierarchy {Bank debt, Bond debt, Convertible bonds}. These companies choose bank debt and then bond debt rather than convertible bonds. This hierarchy is explained mainly by the asymmetric information. The more a company is concerned with asymmetric information, the more that it tends to follow this hierarchy.

Other variables explain the adoption of this hierarchy: the size, the default risk, the deficit and the R&D expenditures of the company. The larger the company is and the more it is engaged in R&D, the more it tends to adopt this hierarchy. However, the more unprofitable and risky the company, the less likely it is to opt for this hierarchy.

This study provides theoretical and managerial contributions. From a theoretical point of view, this research complements the literature on capital structures. It helps in understanding the choice between financing by bank debt, bond debt and convertible bonds. It also allows one to identify some variables explaining the hierarchy of these three categories of debt.

On the managerial level, our results are a guide for managers with good projects that are wishing to guard against the costs inherent in asymmetric information. The choice of the hierarchy {BaD, BoD, CB} also allows them to maximize the wealth of their existing shareholders. Thus, by analyzing the history of issuance of the different categories of debts made by a competing company, managers better understand their competitors and how to compete with them.

At a time of crisis and despite the strong asymmetric information, the debt hierarchy is modified. This change results mainly from the conditions of the offer on the various markets.

There are some limitations to this study. Our empirical study was restricted to a selection of firms' characteristics, but we do not take into account the market conditions, such as the level of risk and the level of the interest rate. It would be interesting for future research to broaden the study to include variables measuring market conditions. Concerning the characteristics of each type of debt, it would be relevant to extend the analysis to include issuance costs. Another possible extension of this work is to analyze the impact of choosing the hierarchy {BaD, BoD, CB} on the value of the firm adopting it.

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