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Agency Conflict between Principal and Agent in the Treatment and Transfer of Information: Validation by the Internal Ratings and Scoring of Borrowers in the Deposit Tunisian Banks

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Abstract: ***The purpose of this article is to explore the effect of information asymmetry in the context of agency conflicts between the principal-agent (director-Customer Relations Manager) in a bank concerning the transfer of Hard and soft information on the regulatory capital and economic capital under Basel III regulations. Several studies have used scoring models to examine the issue of information asymmetry. Our contribution to this stream of research is not only to integrate the two types of soft and hard information in the scoring models, but also to test error manipulation by bank managers during transfer of this information and its processing by customer service. The scoring model that we will apply plays a reverse role. Instead of testing it, we will assume it is reliable. Therefore, the errors made by the model when classifying borrowers will be denoted as credit risk or opportunity costs. This would allow us to identify fraud and manipulation rate made by customer service and therefore to detect information asymmetry between customer service and bank manager. The empirical analysis includes a sample of 100 creditworthy and defaulting borrowers according to Tunisian banks. This analysis is the subject of the calculation of scores and default probabilities to formboth the regulatory and the economic capital using primarily the Hard information and secondly the soft information to compare between the two cases to see the reliability of the information reportedby the customer relations manager to the director and therefore deduce the effect of such a manipulation of information on the regulatory and economic capital. The results showed that the asymmetry of information comes mainly from the manipulation of the soft information and specifically on the quality of the warranty. This asymmetry of soft information has the effect of increasing the risk of error as well as the credit risk and therefore more requirements of economic and regulatory capital. This situation can be solved in the case of Tunisian banks given that the authorities in charge require more regulatory capital against the economic one the thing that may fill frauds and manipulations.***

Keywords: Agency conflict, credit risk, information Hard, information Soft, regulatory capital, Basel III

1. Introduction

Two types of information can be processed and reported by the customer relations manager to bank director, namely the Hard and Soft information. The first is based on data extracted from the accounting documents. The second, on the other hand, is based on qualitative, confidential and rare information usually collected from questionnaires. This kind of information is hardly transferred between different hierarchies(Petersan and Rajan (1994)).

Based on these two types of information, a conflict of interest between the director and customer relations manager in the bank is deduced. This is due to the lack of precision in the transfer of Hard information and manipulation of the Soft one. Indeed, each of the ones responsible admits a different kind of interest. The director seeks reliable information in order to achieve short-term performance and grow, by contrast, the customer relations manager seeks to increase his salary. We distinguish several factors that establish and maintain the relationship between thesetwo parties i.e. the funds allocated by the director to the customer relations managerto grant credits, economic capital, regulatory capital and remuneration.(John, Litov, Yeung (2008)).

In this paper, we first discuss the theoretical literature of the asymmetry of hard and soft information between the customer relations manager and the director and its effect on the credit risk and the relationship between economic capital and regulatory capital. Subsequently, we try to analyze this empirically in a methodological component.

2. Literature Review: Asymmetry of Information related to the Manipulation of Information

The asymmetry of information between the customer relations manager and the director of the bank, was the subject of Godbillon-Camus and Godlewski (2005)work. These authors emphasized the certainty of the transfer of information both Hard and Soft from the customer relations manager to the Director and the possibility of a manipulation that can generate more credit risk and more regulatory capital to cover it.

These authors formulated a theoretical model based on maximizing the utility of customer relations manager and the bank director depending on the risk factor downpour, the funds available forthe former to grant credits, the achieved returns of these funds and on other factors such as the remuneration of the customer relations manager, the amount of deposits, the insurance premium in case of bankruptcy…etc.

They found that the signal sent from the customer relations manager to the bank director concerning the information about the quality of the project to be financed is the sum of

the required return on the available funds (credits) and the error made by the customer relations manager.

The position of the signal sent by the customer relations manager to the Director in relation to the return on assets plays a crucial role: if the signal is equal to the observed asset returns, the agent does not commit an errorconcerning the expected quality of the project thus indicating that the information is reliable. If the signal is greater than the asset performance, the agent commits an errorthus implying false information and therefore the agent has overvalued the project resulting in credit risk. By contrast, if the signal is below the asset performance, the agent commits an error and therefore the customer relations manager undervalued the project which results in a shortfall for the bank not to fund this project called cost opportunity.

The conflict of interests between the director and the customer relations manager can be observed since the former seeks profitability in a short time in order to grow and satisfy shareholders without taking any risk while the former'sobjective isto guarantee the return achieved from granted loans so as to increase his remuneration. However, both partiesshare the same view concerning risk-taking. They are risk averse (John and Young (2008)).

The customer relations manager can cause a high risk due to the lack of precision or to the manipulation of information transfer. If the manager makes a mistake, this will cost the bank a lot of money given that it must be covered by the economic capital (VAR).

The latter is the minimum capital that must be hold by the bank to accept a probability of default**α**. In other words, beyond this minimal value of capital, the bank goes bankrupt for a default probability higher than α. It is measured by the value-at-risk VAR (Lang et al (2008)).

To resolve this conflict, the director maximizes his\her utility under the constraint that the customer relations manager admits a higher utilitythan his reservation utility **U**in addition to the fact that the regulatory capital **K** is higher than the economic capital; the latter is based on optimal capitals available for the customer relations managerin order to grant credits.

According to these authors, the agency problem will never be solved unless the regulatory capital exceeds the economic capital assigned for credit risk hedging. By maximizing the utility of the customer relations manager, the optimal funds made available to the customer relations manager to grant credits. In addition, it follows regulatory capital required according to the optimal funds.

According to the regulations of Basel III, the new norm establishes a regulatory capital requirement that is equal to 10.5% * **risks adjusted assets**. The latter is the set of credits (exposed in case of default) weighted according to the degree of risk of each borrower. The method of calculation of regulatory capital that is based on internal rating assumes a single weighting to be applied to all loans. This weighting is expressed in terms of correlations among all borrowers and default probabilities. The simplified formula of the Basel III:The regulatory capital requirement =5% * overall * Weighting Exposure at default. (See Committee on Banking Supervision annexe1.Basel 2010.)

By analogy with the methodological sequence of these authors, we can approximate the exposure at default funds allocated for the provision of credit. It is evident that:

The required regulatory capital (K) = 10.5% * overall * Weighting A; with **A**: Funds allocated to the customer relations manager to grant credits.

These authors showed that the signal sent from the customer relations manager to the director is positively related to the volume of funds processed by the information Hard. An increase in this signal indicates that the customer relations manager has committed fewer errors allowing to have more funds at his /her disposal. The higher the signal is, the greater the quality of the project becomes. It is to be taken into account that this signal depends on the error committed by the Information producer. Therefore and in order for the agent to have more assets at his/her disposal, he must have a higher signal than the risk-adjusted deposits performance which may be the credit risk in case the agent overvalued the project. The optimal volume of loans granted by the customer relations manager depends on the quality of information required and is not dependent on his\her remuneration. This Hard information is complete, therefore the customer relations manager has no interest to manipulate it and this gives his salary a fixed status.

In the case of soft information, both the amount of credit granted by the agent and the minimum capital that the bank needs to maintain the maximum fault threshold α depend on the manipulation of information. The better the information is handled, the more the manager reduces his trusts towards the agent and then the budget available will be cut. All this involves a credit risk increase and a decrease in equity.

The relative variation in the equity allotted to loansin terms of the signal, shows that the capital increase is accompanied by an increase of a good signal provided that the latter is higher than the increase in the risk of error in the Soft information. The variation of capital in terms of the signal depends only on the risk of error in Hard information. Therefore, the higher the risk of committing a signal error by the agent, the lower the capital becomes available to the agent.

As for the regulatory capital required to hedge credit risk, it negatively depends on the level of risk averse from the part of the manager such as not taking risks. This causes a lightening of the level of regulatory capital. Moreover, the transparency of the signal sent from the customer relations manager to the director also contributes to the reduction of the regulatory capital.

The gap between the volumes of funds allocated to customer relations manager is negative. This indicates that in the presence of Soft information, the customer relations manager may have given a higher budget to convert it into loans.

Generally speaking, the combination of the Hard and Soft information allows better control of credit risk provided that there is less manipulation of information from the part of the agent.

3. Methodology

This section tries to separate and understand the information asymmetry that may exist between the director and the customer relations manager in the bank itself within the information transfer process. The customer relations manager collected all the necessary information about borrowers and subsequently sends them to thedirector to motivate him to make the decision. Within Basel III boundaries, the decision is taken by the score model or even by the internal rating of the bank.

Therefore, this study gives a new theoretical contribution that is the outcome of work on the regulation of Basel, trying to make a theoretical practice convergence between the method of internal rating of borrowers that subsequently enables to build the economic capital and the regulatory capital as well as the transfer of information in a context of asymmetric information that may exist.

Each borrower's rating model describes the available information about each borrower based on different weightings for each information in order to give the final markthat is called score. The information is processed by the customer relations manager and transferred to the director (Barakat Chernoubai and Wahranburg (2014)). Hence, the emergence of the idea of using this type of model as a means of relevance and certainty of information processed by the customer relations manager. The relevance of these models is measured by the rate of error or the error that may be committed by the customer relations manager in terms of information transfer.

In this section, we will try to prepare a scoring model to better distinguish between creditworthy borrowers and those who may default. Indeed, this model allows us to note the customers' scores which will be converted later into a probability of default according to the internal rating system Basel III. First, we will deal with a score model of Hard information only and then another model including the Soft information.

The objective of this section is to identify the errors of precision and manipulation in terms of the transfer of information, on the one hand and the information asymmetry between the director and the customer relations manager, on the other hand.

3.1 Sample

Our sample included 150 bank credit records collected from two Tunisian banks namely; BFPME and STB ranging from 1994 to 2014. These credit records are divided into two groups: 67 good companies (solvent) and 83 default enterprises (insolvent). The criterion for distinguishing between the two is late payment. For example, if a company has more than 3 delays, it is considered bad.

3.2 Model specification: model of internal rating

The equation for the discriminant analysis, as described by Altman (1968), Lee et al (1997), Desai et al (1996), Bardos (1998), Kim et al (2000), is as follows:

Z = x1 + w_2 w_1 x2 + ⋯ w_n xn;with **wi** is the weighting of each explanatory variable Soft and Hard **xi** and **Z** is the score of each borrower.

The variables of Soft type are the following:

1) **The repayment term:** the real period of repayment of the loan ranging from the subscription date to maturity. It is expressed in number of years.
2) **The Interest rate:** is the lending rate charged by the bank for different types of loans. This is the difference between the money market rate (MMR) and the margin imposed by the bank.
3) **The guarantee:**is a binary variable that takes the value 0 if the borrower does not a guarantee and 1 if the borrower has collateral.
4) **The business:** is a binary variable that takes the value 1 if the company is commercial and 0 if it is industrial.
5) **The banking relationship:**is a binary variable that takes the value 0 if the borrower is new and has no previous relationship with the bank and 1 if the borrower is a loyal customerof the bank who admits a credit history with that bank.
6) **The credit amount:** the amount of credit granted by the bank to each borrower.

The variables of Hard type are:

1) **The Financial profitability** (net profit task / Equity): the financial return on equity of the borrower. It indicates the financial situation of the company, on the one hand and the shareholder's satisfaction as well as the reputation of this company on the financial market on the other hand.
2) **The economic Profitability:** (Task Result / Total assets): This is the profitability of the borrower's assets or the profitability of his short and long term investments.
3) **The degree of public indebtedness** (debts / total assets): This is the level of indebtedness of the company. A very indebted company is a considered a serious problem for the bank.
4) **The degree of short-term indebtedness** (short-term debts / Total Liabilities): This is the level of short-term debt. A very short term indebted company may have problems in meeting its short-term commitments.
5) **The degree of long-term debt** (long-term debts / Total Liabilities): the level of long-term debt. Long-term debt reduces the chance to be granted a credit from the bank.
6) **The weight of assets** (net assets / Total assets): A borrower, who has a significant share of capital, has productive capital strength in the market for goods and services that can enhance his reputation and helps him to get credits. In case of default, the bank can resort to liquidate his assets.
7) **The rotation of the turnover** (gross operating profit / Revenues): this is the rotation of the turnover or the margin on turnover. A good margin on turnover without

including personal expenses indicates the strength of the company to cover the charges.

8) **The productivity per employee** (Turnover / number of employees): it is an economic index that measures productivity per employee in the company. The company admits that good productivity has the chance to quickly recover its costs and therefore strengthen the short-term repayment capacity.
9) **The general solvency** (total assets / total liabilities): it is a relevant indicator for the bank. It helps explore the state of default or corporate solvency. A good indicator of solvency shows that the company may liquidate its investment in order to meet its obligations and debts.
10) **The general liquidity** (Current Assets / Current Liabilities): this is the engine of the company's business. A liquid company is not able to meet its short-term commitments and pay its loan installments.

4. Results

Un modèle admettant des taux d'erreur de classification, montre que les informations auquel ont été introduit pour l'établir, sont factices et ne reflète pas l'état réel des emprunteurs. Ces taux d'erreurs sont de deux types :

We dealt with the score models orthe internal rating the by SPSS.16 software using two kinds of information: the Soft information and Hard information. The first model, we generated, is based on Hard information while the second deals with both kinds namely; the Hard information and Soft information (See Appendix). A model that assumes a classification error rate, shows that the information which has been introduced to establish it, are fictitious and does not reflect the real state of borrowers. These error rates are of two types:

- Type **I** is the error rate of bad cases ranking; in other words, it is the percentage of bad cases classified in the right class. If the bank has a high rate for a long period in which the credit distribution policy is high, it is exposed to credit risk.
- Type II is the error rate of good cases ranking. In other words it is the good percentage of cases classified in the wrong class. If the bank has a high rate for a long period with which the credit distribution policy is restrictive, the bank loses market share and would be subsequently exposed to commercial risk.

Making an analogy between Camus literature cited below and the internal assessment literature cited by the Basel Committee in 2009 and other authors like Type I error, committed by the customer relations manager using scoring models, is equivalent to the situation where the signal sent from this manager to the director in charge is lower than the return on allocated funds for credit and thus there is a credit risk. On the other hand, type II error observed in the internal ratings models is equivalent to the situation where the signal is sent greater than the return of funds allocated to loans noticed by an opportunity cost.

The results of classification score models are summarized in the following table:

The classification results by the Hard information							
	Default		Prévisions				Total
			no		yes		
			Hard		Hard et Soft		
Original	Number	no	32	35	13	10	45
		yes	14	21	41	34	55
	Percentage	no	71,1	77.8	28,9	22.2	100,0
		yes	25,5	38.2	74,5	61.8	100,0
Rate of good ranking				73.3%		69.0%	

The classification results of Hard and Soft Information

We noticed that the score models dealt by the Hard information provide a good ranking rate (73%) and type I error rate (credit risk) (25.5%) that are better than those dealt by both hard and Soft information (69% / 38.2% (credit risk).

The lack of reliability and transparency of data can be causedby the customer relations manager and not the borrower himself. This is because the former is responsible for data collection, verification, accuracy of any type of hard or soft information. He can make mistakes when transferring information to the director who will make the decisions. These errors are of two types. When it comes to Hard information, the customer relations manager can be wrong in the values of variables due to lack of data and accuracy. By contrast, if it is soft information, the customer relations manager can manipulate it and transfer it after being altered to the director.

Integrating Soft information is not sufficient to minimize the credit risk, it allows to increase the risk which shows that this additional information can be manipulated or improperly transferred between different hierarchies in the bank. The soft information is adapted to a decentralized organizational structure or the majority of the hierarchical organizations of Tunisian banks are centralized which gives character of power to the holder. The Hard information cannot be manipulated, so the credit analyst commits fewer errors in processing credit files which leads to a decrease in credit risk. This result is consistent with that of Godlowski (2004).

On the other hand, we tried to explore the effect of the error of transmission of Hard and Soft information on the detention of the economic and regulatory capital.

Among theyields of the lack effectiveness of market discipline fromthe internal and external governance mechanisms is obtaining high default probabilities. Consequently a higher regulatory capital may not reflect its economic value where a discrepancy between economic and regulatory capital emerges and the possibility of arbitrage between these two types of capital and opportunistic behavior that can be caused by the leaders in terms of risk taking.

	Economic capital	Regulatorycapital
Hard Information	2.17%	3.87%
Hard and SoftInformation	2.14%	3.29%

On the other hand, we remarked that when using the Hard information only, the banker uses less regulatory and

economic capital. The inclusion of information Soft allows to increase the risk and therefore requires more capital to cover defaulted loans.

With reference to Camus's approach, the agency conflict between the customer relations manager and the director persists when the former seeks credits profitability in order to receive more salaries and benefits. By contrast, the director seeks bank's financial performance to satisfy shareholders. Therefore, the customer relations manager falls in the manipulations so that he camouflages results and shows a short-term profitability, which allows him/her to be better paid.

This conflict can be regularized, when the bank accepts a higher regulatory capital requirement than economic capital. Thereby it covers the additional handling of the risk by using regulatory capital.

According to this representative sample,this situation is similar to Tunisian banks situation. We assume a regulatory capital of 3.29% while the economic capital is of 2.14%. Therefore, Tunisian banks admit a regulatory capital as required by Basel III that is higher than the economic capital. This can resolve the conflict and mitigate credit risk; the balance between the two types of capital provides a safety measure against defaults and manipulations

In addition, the two capital cited below did not take into account the risk of fraud, economic capital reflects more the real risk of the bank's regulatory capital because the latter is standard for all banks . In this case, the sample of borrowers actually requires economic capital, but applying the highest regulatory capital to economic capital can solve the risk of manipulation and fraud. In cases where the regulatory capital is lower than the economic capital, the authorities require less funding compared to normal: in this case, the risk will be swollen.On the one hand, it will not be covered by the funds and on the other hand, the risk of manipulation remains uncovered. In this case, the banks have to allocate regulatory capital associated with operational risk as set by Basel III. Chernobai, Jorion, Yu (2011).

5. Conclusion

The theoretical literature of this article has enabled us to focus on the agency in the bank relationship between the director and the customer relations manager regarding the transfer of Hard and Soft information. The latter seeks profitable customer credits in order to increase his compensation while the formerseeks short-term financial profitability so as to satisfy the customers and take roots in the bank. The mistake made by the customer relations manager can cause either a credit risk or can be an opportunity. The last two errors can cause more demand for economic and regulatory capital. This agency problem will be solved when regulatory capital exceeds the economic capital as it compensates for the error and manipulation of information.

The empirical part of this study, on the other hand, emphasized the analogy between the internal rating models and the theoretical model of information transfer of Godloweski and Camus (2005). The results of this study showed that the more the customer relations manager uses the Soft information, the higherthe credit risk will be. Thisincreases the possibility of manipulating or altering this type of information. This requires one of the two types of capitalbe it economic or regulatory (funds required to cover credit risk). Although this type of information requires more capital to cover credit risk, the problem is solved because in all cases, regulations require more capital compared to the actual situation shown by the positive difference between regulatory capital and economic capital, this takes into account the fraud and information manipulations as well as the risk covering of additional credit.

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Annexe 1

Equation canonique par l'information Hard et Soft		
	Fonction	
	Hard et Soft	Hard
Durée de remboursement	0,140	Fonction
Taux d'intérêt	-1,351	
Garantie	-1,125	
Forme légale	-0,751	
Relation	0,520	
Montant du crédit	0,211	0.015
Rentabilité financière	0,223	0.330
Rentabilité économique	0,007	0.043
Part des capitaux propres	3,342	3.301
Endettement	-1,082	-0.838
Endettement à long terme LT	0,490	0.961
Immobilisations	-1,226	-1.364
Rotation de l'actif	-0,030	-0.034
Productivité	0,000	
Solvabilité	0,001	0.001
Liquidité	0,144	0.119
(Constant)	-1,746	-0.357

Fonction canonique de l'analyse discriminante

Annexe 2 : Capital économique

Capital économique = Perte non attendue = Perte maximale – Perte attendue

$$Value - at - risk = Quantile(99.9\%)[P(x) \times PCD \times ECD]$$

Avec,

- La perte en cas de défaut PCD : c'est le taux de la perte réalisée sur les crédits accordés par la banque ou encore c'est le taux de non recouvrement des crédits. Dans notre cas ce taux est constant et égal à 45%. C'est-à-dire que la banque espère couvrir que 55% des crédits accordés aux emprunteurs défaillants.
- L'exposition en cas de défaut (ECD) : c'est la valeur nominale de crédit concerné au moment de défaut.
- La probabilité conditionnelle P(x) : c'est la probabilité conditionnée de la réalisation du facteur systématique x. Elle est exprimée par la relation suivante :

$$P(x) = \Phi\left[\sqrt{1+w^2}\,\Phi^{-1}(PD) - wx\right]$$

Ou'

- Φ est la fonction de distribution normale centrée et réduite.
- Φ^{-1} est fonction de distribution réciproque normale centrée et réduite.
- ***PD*** est la probabilité de défaut de chaque emprunteur
- ***X*** est le facteur de risque systématique
- ***W*** est la sensibilité par rapport au risque systématique x ou encore le coefficient de corrélation entre les défaillants.

La perte attendue $= [P(x) \times PCD \times ECD]$

Annexe 3 : capital réglementaire par l'approche IRB Bâle III

Capital réglementaire = Perte non attendue = Perte maximale – Perte attendue

$$K_m = \Phi\left[\frac{\sqrt{w}\,\Phi^{-1}(0.999) + \Phi^{-1}(PD)}{\sqrt{1-w}}\right] \times PCD \times ECD - (PD \times PCD \times ECD)$$