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Effect of the Introduction of Blockchain Technology in Financial Accounting on Earnings Management: Case of Tunisian Banks

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Abstract

Blockchain technology has started to develop rapidly and is gradually being used in e- government, finance, deposits, etc. In addition, the effectiveness and influencing factors of its introduction are also debated and are of great scientific research interest. Furthermore, in this new rapidly changing environment, the problem of earnings management has become increasingly important. The purpose of this paper is to study the impact of blockchain technology on earnings management in Tunisian banks. Our empirical study is based on ten listed Tunisian banks over a period from 2010 to 2022.

Using panel data methodology, we showed that blockchain technology has a non-significant negative effect on earnings management. Furthermore, in order to test the possible effect of governance on this relationship, we were able to showthe moderating effect of the board size on the effect of Blockchain technology on earnings management. However, the board independence members seem to have a negative but not significant effect on the relationship between Blockchain technology on earnings management in Tunisian banks.

Keywords: Blockchain technology, Earnings management, Tunisian banks

Introduction

Blockchain technology begins to develop rapidly and is gradually used in e-government, finance, deposits, etc. Thus, the effectiveness and influencing factors of the introduction and specific application of blockchain technology in management processes are also discussed of great interest for scientific research . Furthermore, in an environment marked by a multitude of financial crises and scandals, the issue of earnings management has become increasingly worrying.

This study tests the impact of the use of Blockchain technology in financial accounting on earnings management. In fact, the application of blockchain technology can serve as a platform for companies to voluntarily disclose information and serve as a quality signal for companies to resolve trust issues with investors. This application could therefore have a significant impact on financial accounting and subsequently on the financial reporting quality. This can effectively reduce disclosure and earnings management errors, significantly improve the quality of accounting information, and alleviate the problem of information asymmetry. However, empirical research on the impact of blockchain technology and its application on regulated sector samples is rare.

This paper examines the impact of blockchain technology on earnings accounting management by testing the moderating effect of the board of directors on this relationship in banks. In fact, studies conducted on this topic have yielded mixed results. Some authors found a significant positive effect of Blockchain on earnings management [1], other authors found a significant negative effect of Blockchain on earnings management [2, 3] However, some other authors found no significant relationship between the application of Blockchain technology and earnings management. The lack of consensus around the relationship between the introduction of Blockchain technology and earnings management prompted us to question the nature of Blockchain's impact on earnings management practices within Tunisian commercial banks.

In fact, in the Tunisian context, blockchain technology has also begun to develop in recent years and has been gradually applied in banks (STB: First Swift gpi bank in North Africa from 2019) and public institutions (PTT, Distributed Ledger Technology). However, Tunisian banks suffer from certain obstacles to the use of Blockchain, including regulatory constraints, security problems, resistance to change and lack of financial resources.

Although, since 2017, the Tunisian Central Bank has been seeking innovative "decashing" solutions in order to curb the culture of cash transactions, which harms banking development and promotes illegal exchanges. And it was in Tunis that the first Africa Blockchain Summit and the largest African blockchain hackathon took place in May 2018. The BCT has also introduced a Blockchain committee within it.

The purpose of this article is twofold. The first objective is to study the impact of the introduction of Blockchain technology on earnings management in Tunisian banks. While the second objective is to study the moderating effect of the board of directors via two characteristics (the size and independence of the members) on the relationship between Blockchain and earnings management in Tunisian banks.

This paper will be organized as follows, the second section will be devoted to the literature review and the development of hypotheses. In the third section, we will present the research methodology. The fourth section is devoted to the discussion, and we will end with section five which is reserved for the conclusion.

Literature Review and Hypothesis Development

Blockchain was first heard of in the early 1980s, when computer scientist David Chaum attempted to use cryptography to make anonymous transactions. Later, notably in the 1990s, two computer engineers, Stuart Harber and Scott Stornetta, attempted to find a system that could protect time-stamped documents and protect them against tampering and backdating.

In 2008, Satoshi Nakamoto proposed the first concrete application of blockchain technology. Subsequently, a cryptosystem designed by David Chaum was developed (the first ever decentralized digital currency system based on peer-to-peer technology). Blockchain, the technology behind Bitcoin-like cryptocurrencies, is a type of accounting ledger. "Ledger": A ledger (database) in which all accounting balances (who owns what) are recorded. Unlike traditional "SQL…" type databases, blockchain type databases are shared between several servers, each server having an identical copy. Farnoush et al. state that blockchain technology is an emerging but innovative technology.

Many reports indicate that the use of blockchain will revolutionize various processes and bring many competitive advantages to businesses using blockchain. However, without a comprehensive understanding of blockchain usage and implementation, the report notes that blockchain can expose businesses to unknown risks and costs. In recent years, many global banks and financial institutions have shown great interest in blockchain technology and are seeking to profit from its properties. In fact, blockchain technology and cloud computing can create a new type of financial sharing system.

Relationship between Blochchain Technology and Earnings Management

Having a multitude of advantages, including, in particular, the guarantee of the openness and transparency of information, the security of information, the impossibility of data fraud; reliability of information, Blockchain technology had certain limitations. The main limitations boil down to its limited ability to process large amounts of data. For example, the Bitcoin blockchain limits its blocks to a maximum of 1 MB, the difficulty of maintaining the confidentiality of information within the blockchain, the difficulty of regulating the blockchain.

This application could therefore have a significant impact on financial accounting and subsequently earnings management. In fact, earnings management can be defined as Deliberate intervention in the external financial reporting process with the aim of appropriating personal gains, Schipper. Earnings management finds its theoretical foundations in the positive theory of accounting. The objective of this theory was to deduce, from the observation of accounting practices, a set of empirically validated rules of behavior. In fact, three hypotheses of this theory are defined.

The first hypothesis is the "debt hypothesis"; the second is the "remuneration hypothesis" and the third is the "size hypothesis". In fact, there are two streams of research. The first trend means that earnings management could take the form of accounting. On the other hand, the second current supports the idea that earnings management could take, rather, the real form [4]. Real earnings management is based on decisions made by the manager having a direct influence on cash flow [5]. in this work, we will focus on the accounting earnings management.

Furthermore, the problem of earnings management is more accentuated in banks. The literature review allowed us to note that banks use loan loss provisions as a main technique for earnings management. Ozili, PK. finds that banks will use accruals, such as LLPs, to manage their profits when CBDC-induced bank disintermediation results in reduced bank deposits, reduced bank lending, and a likely reduction in reported profits . Bank executives will mitigate the reduction in reported profits by reducing discretionary LLPs to increase reported profits.

We thus formulate our first hypothesis, namely:
H1: The application of blockchain technology has a negative effect on abnormal provisions for doubtful debts in Tunisian banks.

The Board of Directors and Earnings Management in the Blockchain Era

When applying blockchain technology in banks, information asymmetry will be reduced through the decentralization of blockchain technology and tamper-proof smart contracts, etc. Added to this are the effective corporate governance measures that will be introduced which act as guardians of the company's contractual rules, protect the interests of shareholders and monitor the company's accounting information and subsequently improve the quality of the financial information disclosed.

Zhang and Guan found that the use of blockchain technology by listed companies can significantly hinder earnings management,

and the proportion of shares of institutional investors and the proportion of independent directors have a strengthening effect. positive adjustment on this inhibition. In this context, Fahlevi et al. state that corporate governance must be improved in the new context of economic globalization which constitutes a new challenge, particularly for developing countries. These authors showed that one of the important elements of blockchain adoption in the implementation of corporate governance must emphasize the high security factor, because the agency theory and Agency conflicts which are classic problems in corporate governance are the main problems that can be solved with the presence of blockchain to reduce fraud, profit manipulation and earnings management.

In fact, the agency theory or mandate theory, which appeared in 1976 with the work of Jensen and Meckling, challenges the idea that the company is considered as a single actor by emphasizing the divergences potential interests between the different partners (managers, shareholders and creditors, etc.); hence the appearance of the managerial firm characterized by the separation of ownership and decision-making functions. According to these authors, the problem of agency concerns any contract between individuals. When there is a divergence of interests or imperfect information or an asymmetry, agency theory provides remedies.

According to E. Fama, the agency theory is thus based on two behavioral hypotheses, the first presuming that individuals seek to maximize utility while the other is based on the profit obtained resulting from the incompleteness of contracts. On the other hand, the asymmetry in the distribution of information added to a divergence of interests generates an agency problem. Thus, agency relationships give rise to problems of moral risk, adverse selection and opportunism giving rise to information privileges held by managers.

In addition, the shareholder does not always have the skills to properly manage his own interests. In this case, it is probable, according to M. Jensen and W. Meckling, that the manager manipulates the information in his own interest and therefore reduces that of the owner. The principal will therefore have to play the role of arbitrator and will put in place control mechanisms in order to limit losses caused by a divergence of interests.

However, the implementation of control techniques and incentive systems to limit conflicts of interest will not be done without agency costs. Fama states that the board of directors plays a vital role in the functioning of companies. Fama and Jensen emphasize the important role that the board of directors plays in controlling the actions of managers and in resolving agency conflicts between shareholders and managers. The board of directors is thus considered one of the most important internal governance mechanisms whose members are elected by the General Assembly. This council constitutes the main management control body.

As such, Hermalin and Weisbah ensure that the board of directors constitutes an obligation according to the laws and regulations of each country. Thus, most companies are required to have a board which must satisfy several conditions, such as the presence of several members, the existence of subcommittees and the independence of directors from the management team. Thus, the effectiveness of the board of directors depends on its characteristics (size, independence of members, presence of women, etc.). In this study we will limit ourselves to two essential characteristics, namely the size of the board of directors and the independence of the members).

The Board Size of Directors and Earnings Management

Work on the impact of the size of the board of directors on earningsmanagement in banks presents contradictory results. Indeed, several studies suggest that small boards have a much more important and effective control function compared to boards with a high number of directors who present difficulties in coordinating their efforts. The latter generates the amplification of agency problems within banks and push managers to pursue their own interests (Godard and Schatt, 2000) [6].

The small size of the board favors the alignment of interests of managers to those of shareholders allowing the improvement of the performance of banks [7]. In this sense, Hsu affirms that the board size creates problems of coordination and control between its members and that the Investors in the market believe that small boards are more effective in monitoring managers than large boards.

Other authors such as Gary and Gleason note that the board size does not have a significant effect on the probability of bank failure. However, other authors such as Gary and Gleason show that the small board can be easily controlled and influenced by the manager, which affects its proper functioning at a time when large boards have a variety of experiences belonging to the various administrators.

Based on the above, we formulate our second hypothesis:
H-2: The size of the board of directors has a negative effect on the effect of the application of blockchain technology by Tunisian banks on abnormal provisions for doubtful debts.

The Board Independence and Earnings Management

As for the independence of the members of the board of directors, the literature review allowed us to distinguish specific impacts of this characteristic, namely: the ability of independent directors to independently and carefully evaluate the bank's financial reports to ensure transparency and reliability of financial results and reports and the ability to comprehensively monitor and supervise the bank's internal controls which ensures transparency and reliability of the bank's financial information and builds trust of the different stakeholders. However, studies dealing with the impact of independent directors on the board on earnings management in banks are not abundant and find divergent results.

Chang and Sun and Sierra García et al and Chang, among others, found a significant negative relationship between the independence of board members and earnings management. Other authors, including Piot and Janin and Baccouche et al. found a significant positive relationship between the independence of board members and earnings management in banks. Whereas some authors found no significant relationship between the independence of board members and earnings management in banks. As such, Gary and Gleason explain these results by the fact that external directors would not be able to understand the complexity of the bank's activities, resolve agency conflicts between all agents and fulfill their main role at namely the discipline of leaders.

In this study, we assume that independent directors in the board of directors can advance the inhibiting effect of Blockchain technology on earnings management. Hence, our third hypothesis

H-3: the proportion of independent directors has a negative effect on the effect of the application of blockchain technology by Tunisian banks on abnormal provisions for doubtful debts.

Research Methodology 1- Sample and Study Period

In order to test our hypotheses, we based ourselves on a sample of ten Tunisian commercial (or deposit) banks which are listed on the Tunis Stock Exchange. The study period extends from 2010 to 2022, giving rise to 130 observations.

Model to Estimate and Measurement of Variables a- The Models to Estimate.

In this study, we will estimate three different models. In the first model (1), we will test the effect of the introduction of Blockchain technology on abnormal provisions for doubtful debts. In the second model (2), we will test the moderating effect of the size of the board of directors on the relationship between the introduction of Blockchain technology and earnings management. And in the third model (3), we will test the moderating effect of the independence of board members on the relationship between the introduction of Blockchain technology and earnings management. The three models are:

First model

$$ALLP_{it} = \beta_0 + \beta_1 BC + \beta_2 ROA + \beta_3 LASSET_{it} + \varepsilon_{it}$$

Second model

$$ALLP_{it} = \beta_0 + \beta_1 BIND_{it} + \beta_2 BC + \beta_3 BC * BSIZE_{it} + \beta_4 ROA + \beta_5 LASSET_{it} + \varepsilon_{it}$$

Third model

$$ALLP_{it} = \beta_0 + \beta_1 BIND_{it} + \beta_2 BC + \beta_3 BC * BIND_{it} + \beta_4 ROA + \beta_5 LASSET_{it} + \varepsilon_{it}$$

Table 1: Measurement of Variables

Variable type	Variable name	Meaning	Measure
ALLP	explained variable	Abnormal loan loss provisions	This variable is measured by the error term following the estimation of total provisions using the following model: $LLP=\beta_0+\beta_1 NPL_{it-1} + \beta_2 CHNPL_{it} + \beta_3 CHLOAN_{it}+E_{it} +$
BC	Explanatory variable	Blockchain	binary variable which is equal to 1 to the samples that have applied blockchain technology, and 0 otherwise
BIND	Adjusting variable	Board independence	The number of independent members divided by the total number of its members
BSIZE	Adjusting variable	Board size	The natural logarithm of the board members
ROA	Control variable	Return on assets	Net income divided by total assets
LASSET	Control variable	Bank size	The natural logarithm of the total assets of the bank

Regression Results

Descriptive Statistics

The results of the descriptive statistics are presented in Table 2 below:

Table 2: Descriptive Statistics of Study Variables

Variable	Mean	Min	Max	Std. Dev.	Observation
ALLP	.1006977	.0215661	.218	.0510266	130
BC	.2	0	1	.4015474	130
BSIZE	2,331036124	1,791759469	2,63905733	0,209879356	130
BIND	.4735581	.1111111	.9166667	.3171338	130
BC*BSIZE	0,477134074	0	2,63905733	0,961471463	130
BC*BIND	.1098235	0	.9166667	.2580364	130
ROA	.0063237	.0017688	.0146	.0033152	130
LASSET	15.34959	14.60313	15.79213	.3648759	130

According to the descriptive statistics presented in the table above, the Tunisian listed commercial banks in our sample recorded between 2010 and 2022, abnormal loan loss of 10.06% on average. A standard deviation of 5.1% indicates low volatility of this variable in our sample. Regarding the Blockchain variable, it is equal to 20% on average, the standard deviation of this variable is equal to 40.15%. Concerning the characteristics of the board of directors, the descriptive statistics show that the board size is 2.33 on average with a minimum value of 1.79 and a maximum value of 2.63, with a standard deviation of 0.20 indicating low volatility within our sample.

As for the independence of the board of directors, it is 47.35% on average varying between 11.11% and 91.66%. The standard deviation is 31.71%. The BC*SIZE variable is 0.04771 on average with a minimum value of 0 and a maximum value of 2.63. The standard deviation is 96.14%. As for the BC*BIND variable, the results of the descriptive analysis show that the average of this variable is 0.61098 within Tunisian commercial banks with a maximum of .9166667. The standard deviation is .2580364 indicating average volatility of this variable within our sample.

Analysis of Regression Results

Table 3: Regression Results of the Estimation of the Effect of Blockchain on Abnormal Loan Loss Provisions

Coef.		Std. Err	t	P>|t|	[95% Conf. Interval]
BC	-.0022197	.0092905	-0.24	0.812	-.0206053 .0161659
ROA	5.576096	1.165689	4.78	0.000***	3.269231 7.88296
LASSET	-.0831582	.0105157	-7.91	0.000***	-.1039685 -.06234
Constante	1.342325	.1593726	8.42	0.000***	1.026931 1.657719

*****: significant at 1% , ** significant at 5%, * significant at 10 %**

The results of our regression show that there is a non-significant negative relationship between the use of Blockchain technology and accounting earnings management. Our hypothesis H-1 is thus invalidated. Thisresult does not agree with that found by Fang et al.

Regarding the control variables, the regression results of our estimation show that there is a significant negative relationship between return on assets and abnormal provisions for bad debts. This means that a high level of performance in Tunisian banks is associated with a low level of discretionary provisions. These results agree with those found by Cohen et al. as well as Kothari et al. having shown that earnings management is more widespread in poorly performing companies. Likewise, the results of our regression show that there is a significant negative relationship between the size of the bank and abnormal provisions for doubtful debts in the Tunisian banks in our sample. These results can be explained by the fact that the latter are subject to intense surveillance by the State given their significant weight in the financial sector. This result is similar to that of Cornett et al. in a sample of American banks [8-10].

Table 4: Regression Results of the Estimation of the Moderating Effect of Board size on the Effect of Blockchain on Abnormal Loan Loss Provisions

Coef.		Std. Err	t	P>|t|	[95% Conf. Interval]
BSIZE	-.0075771	.0021652	-3.50	0.000***	-.0118208 -.0033333
BC	.0439463	.0492582	0.89	0.372	-.0525981 .1404906
BC*BSIZE	-.0042051	.0044322	-0.95	0.043**	-.0128921 .0044819
ROA	7.156776	1.141983	6.27	0.000***	4.91853 9.395021
LASSET	-.0626282	.0110371	-5.67	0.000***	-.0842605 -.0409959
Constante	1.09687	.1592544	6.89	0.000	.7847369 1.409003

*****: significant at 1% , ** significant at 5%, * significant at 10 %**

Following the regression of our second model, we showed the significant negative effect of the board size on abnormal loan loss provisions in the Tunisian banks in our sample. This suggests that the large size favors the effectiveness of this mechanism in improving the quality of financial information. Which contradicts the agency theory. Indeed, proponents of the agency theory defend the idea stipulating that the domination of managers is all the more favored by the increase in the board size.

As for the effect of the application of Blockchain technology on abnormal loan loss provisions, it turned out to have no significant effect. Concerning the effect of the BC*BSIZE variable, our results show the significant negative effect at level of 5% of this variable on the effect of the application of Blockchain technology on abnormal loan loss provisions. Thus, we showed the moderating effect of the size of the board of directors on the effect of the application of Blockchain technology on discretionary practices in the Tunisian banks in our sample. Our hypothesis H-2 is therefore confirmed.

Regarding the control variables, we showed that the return on assets as well as the size of the bank both had significant negative effects on abnormal loan loss provisions [11-15].

Table 5: Regression Results of the Estimation of the Moderating Effect of Independence of Board Members on the Effect of Blockchain on Abnormal Provisions for Doubtful Debts

	Coef.	Std. Err	t	P>|t|	[95% Conf. Interval]
BIND	-.0189714	.0095997	-1.98	0.048**	-.0377864 -.0001563
BC	-.0192011	.0147061	-1.31	0.192	-.0480245 .0096223
BC*BIND	- .033061	.0255335	1.29	0.195	-.0169838 .0831058
ROA	5.67176	.2534368	22.38	0.000***	5.175033 6.168487
LASSET	-.0797151	.0014536	-54.84	0.000***	-.082564 -.0768661
Constante	1.297618	.0232506	55.81	0.000***	1.252048 1.343188

Regarding the independence of the board of directors, we show that it has a significant negative effect on abnormal provisions for doubtful debts. Our results agree with those found by Nam which states that external directors are the most influential and that they are the only ones who can ensure that banks apply the regulations specific to their activities and that managers do not have discretionary behavior that harms shareholder wealth. Regarding the application of Blockchain technology, we showed that this variable had a non-significant negative effect on abnormal loan loss provisions in the Tunisian banks in our sample.

Likewise, we showed the absence of the moderating effect of the independence of the board of directors on the effect of the application of Blockchain technology on discretionary practices in the Tunisian banks of our sample. The regression results also show that the return on assets and the size of the bank respectively have significant negative effects on abnormal loan loss provisions [16-20].

Conclusion

This paper examines the effect of the application of Blockchain technology in financial accounting on earnings management while testing the moderating effect of the board of directors via two essential characteristics, namely its size and the independence of the members. Although the board of directors alone can contribute to limiting accounting earnings management practices for in Tunisian banks, only its size manages to inhibit discretionary practices in Tunisian banks.

In fact, we were able to show, consistent with our hypothesis, that board size combined with the application of Blockchain technologynegatively affects abnormal provisions for bad debts. So, from our study, it turns out that board size had an important moderating role in limiting discretionary practices. However, we showed the absence of the significant moderating effect of board member independence on the relationship between the application of Blockchain technology and earnings management [21-25].

This can be explained by the fact that the independence of the members of the board of directors has not succeeded in weakening the hoped-for role of this new technology with regard to earnings management since several Tunisian banks do not yet comply with the obligations imposed. by regulatory authorities. A regulatory text is necessary to better benefit from Blockchain technology in Tunisia. However, contrary to our hypothesis, we showed that Blockchain technology does not succeed in reducing abnormal provisions for bad debts.

This can be explained by the fact that Tunisian banks are not yet adapted to the use of this technology, and they are not using this new technology in an effective way to take full advantage of its advantages. Tunisian banks must make a lot of efforts to successfully integrate this new technology into their working system in order to benefit from its potential and its advantages, particularly in terms of control and limitation of earnings management.

Therefore, our study contributes to literature in two important aspects. Firstly, it is a little- studied subject because it concerns the application of a new technology, namely blockchain, in the Tunisian banking sector. Second, this paper addresses the moderating effect of the board of directors on the relationship between the application of blockchain technology and discretionary practices in banks, which has not been further explored in the literature. This sheds light on scientific research on governance [26-28].

Our findings provide an opportunity for regulators, standard-setters and financial market authorities to question the application of blockchain technology and review regulatory requirements related to banks' provisioning policies. However, like any research, our study is not without limitations. These limitations include the small sample size; benchmarking banks from other countries can also provide valuable empirical research opportunities.

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