



Prediction, Prevention and Detection of Fraud in Bank's Financial Statements an Empirical Study of the Tunisian Context

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ABSTRACT

The objective of this paper is to present a model for prediction, prevention and detection of fraud for Tunisian banks. The methodology is to take a battery of financial ratios used by the Federal Deposit Insurance Corporation (FDIC) as indicators of the financial situation of a U.S. bank and try to test their predictive power in three –year horizon before the occurrence of fraud. The results we have achieved show that we can prevent fraud in financial statements of Tunisian banks with four performance ratios, two years before it occurs with a predictive power of about 66.7%

Keywords: Fraud, bank, prevention, ratios, discriminant analysis

Introduction

«Fraud – An intentional act by one or more individuals among management, those charged with governance, employees, or third parties, involving the use of deception to obtain an unjust or illegal advantage.» ISA 240 paragraph 11.

In fact, financial statement fraud is defined differently in the academic literature, professional or in official texts. The Association of Certified Fraud Examiners (ACFE)) defines occupational fraud as: "The use of one's occupation for personal enrichment through the deliberate misuse or misapplication of the employing organization's resources or assets"

A clear definition of financial statement fraud is difficult to discern from the official regulations because until recently, professionals do not use the term "fraud" but rather "intentional errors" or "irregularities". In 1997, as part of SAS No. 82: Consideration of Fraud in a Financial Statement Audit, which was replaced in 2002 by SAS No. 99, AICPA appoints fraud in financial statements as "fraud is an intentional act that results in a material misstatement in financial statements that are the subject of an audit"

Results of the most recent report published by the Association of Certified Fraud Examiners (ACFE) in 2012 were alarming. Indeed, fraud cost 5% of the annual revenue of affected organizations. Financial statement fraud comprised just 8% of the studied cases, but caused the greatest median loss at \$1 million. COSO, in its report published in 2010 showed that for a sample of 347 fraudulent financial reporting cases, median fraud is \$ 12.05 million. The smallest fraud was \$47,200, while the largest totaled \$25.8 billion.

The study of fraud in financial statements of Tunisian banks is needed especially after the revolution in 2011. Tunisians require more transparency and truth about soundness of national organizations. We find that three state-owned banks have been subject to misappropriation of funds in the form of lending generously without collaterals, giving secured loans with very low guarantee value and apply interest rates unrelated to the economic reality that prevailed at the time of operation. It goes without saying that these loans were granted to the family of the past president Ben Ali and his court. These persons have turned into twenty-three years of free reign the country into a financial oligarchy.

1. Literature review and hypotheses

The reasons that lead companies to falsify their accounts to perpetrate fraud in the financial statements are numerous. Economic incentives are very common in cases of financial statement fraud, as also psychotic, egocentric, ideological motivations. Pressures and economic incentives to match analysts' forecasts are fundamental motivations for listed companies subject to financial fraud. The psychological motivations are associated with criminal behavior. Egocentric incentives are summed up in the fact that through fraud the perpetrator increases his personal prestige. In reality, this type of motivation can be perceived as the desire of managers to exercise functional authority in its company and society. Ideological motivations encourage executives to think that through fraud they can become market leaders and improve their position in their firms.

Fraud in financial statements is made, if the company has strong incentives, as well as economic reasons to announce financial performance more favorable than it really should has in accordance with accounting standards. The empirical investigations (Carter and Stover, 1991; Latham and Jacobs, 2000a, 2000b) identified two fundamental variables: managerial ownership and debt limit, which affect the extent of financial statement fraud. These studies have shown that when managerial ownership is between 5-25%, opportunistic behavior of managers are anticipated and probability of engaging in financial statement fraud is higher. Previous research (Carcello and Palmrose, 1994; Dechow et al, 1996; Lys and Watts, 1994) focused on examination of financial difficulties measures in terms of weak financial conditions and financial performance as motivational mechanisms. These studies concluded that motivations to commit financial statement fraud increase when firms know financial difficulties. Moreover, when financial conditions and performance of a company are deteriorated, ability to engage in financial statement fraud increases.

According to COSO Report on fraudulent financial reporting published in 2010, The most commonly cited reasons in the AAERs and summarized by the SEC for US public companies to engage in fraud are:

- Meet external earnings expectations of analysts and others
- Meet internally set financial targets or make the company look better

- Conceal the company's deteriorating financial condition
- Increase the stock price
- Bolster financial position for pending equity or debt financing
- Increase management compensation through achievement of bonus targets and through enhanced stock appreciation
- Cover up assets misappropriated for personal gain."

Recent scandals in corporate governance, reveals that in most companies, managers have incentives to increase profits to improve their compensation especially through subscription to bonus and stock options.

Studies developed on fraud in bank's financial statements are very rare, although the 2012 report of the ACFE, has shown that banking and financial services are sector that is more subject to fraud with 16.7% of fraud cases against 16.6% in the 2010 report. According to the former, there is a strong correlation between the function of fraudster within the company and losses caused by fraud. The median loss caused by the owner / manager is more than three times the median loss caused by managers, and more than nine times the median loss caused by employees.

Ramage et al (1979) noted that errors perpetrated by financial institutions have different characteristics than other sectors. Palmrose (1988) and Saint-Pierre and Anderson (1984) showed that about 30% of lawsuits involve auditors of commercial banks or depository and lending institutions. Kreutzfeldt and Wallace (1986, 1990) noted that misstatement characteristics in terms of error rates and falsified accounts vary across sectors. For example, banks are exposed to significantly higher error rates in liquidity section compared to other sectors. Maletta and Wright (1996) examined 36 commercial banks and 14 depository and lending institutions. Authors showed that these organizations assigned the highest percentage of errors that overstated net income of around 68.8%.

Following this literature review on the determinants of financial statement fraud (FSF), we expose our hypothesis and methodology that we apply in our empirical validation in the context of Tunisian banks. In fact, we adopted the methodology of McAteer(2009). This study selected as independent variables a set of ratios used by the FDIC as indicators of the financial conditions of community banks

Hypotheses

Hypotheses are classified into three groups, depending on the nature of ratios:

Hypothesis relating to performance ratios:

H1: banks with low performance ratios are exposed to more occurrence of managerial fraud in subsequent years.

Hypothesis regarding growth ratios:

H2: banks with high growth ratios have an increased occurrence of managerial fraud in subsequent years.

Hypothesis regarding capital ratios:

H3: banks having low capital ratios undergo an increased occurrence of managerial fraud.

2. Methodology

The objective of this study is to prevent managerial frauds before they occur. This is to test the predictive ability of a battery of ratios one year, two years and three years before the fraud occurrence. We adopt the methodology McAteer (2009). This choice is based on several arguments. Indeed, in addition to the scarcity of studies on the detection and / or prevention of fraud in bank's financial statements, McAteer (2009) used a set of high number of ratios and is based primarily on prevention of fraud before it occurs, so there is a concern of prediction, detection and prevention. It's considered as an issue that seems to us to be relevant in managing the risk of bankruptcy.

2.1. Sample and period selection

We conducted our empirical tests on a sample of ten Tunisian universal banks, namely Attijari Bank, Banque Internationale Arabe de Tunisie (BIAT), Banque Nationale Agricole (BNA), Société Tunisienne de Banque (STB), Banque de Tunisie (BT), Banque de l'Habitat(BH), Amen Bank, Arab Tunisian Bank (ATB), Union Internationale de Banques (UIB), Union Bancaire pour le Commerce et l'Industrie (UBCI). The sample of fraudulent banks is: BIAT, BH, BNA and STB. The control group is composed of remaining banks namely BT, UIB, ATB, Amen Bank, UBCI and Attijari Bank.

The period chosen depends on the year of fraud occurrence; it is generally from 2003 to 2010. Indeed, methodology consists on choosing three-year period prior to the occurrence of fraud for fraudulent bank and its equivalent non-fraudulent. Besides, the year of fraud occurrence is based on information publication that is either openly or covertly. Based on the reports of auditors published in the annual reports of banks and official bulletins (BO) of the Financial Market Council (CMF), we find that BH, BIAT, BNA and STB conducted fraud in 2010. Therefore, we take as reference annual reports of the Court of Auditors to detect the suspicion and occurrence of frauds for STB in 2006 and BNA in 2007.

2.2. Model adaptation

We adapted the methodology of McAteer (2009) to Tunisian context. We have a dichotomous dependent variable equals to 1 for fraudulent banks and is equal to 0 for non-fraudulent banks. The independent variables selected are a set of 18 ratios against 26 ratios used in the baseline study. Indeed, some data are not available for all our banks and / or for the entire period, such as the solvency ratio: Cooke or tier 1, classified loans, loans written-off.

These ratios are classified into three categories: performance ratios, growth ratio and capital ratio

Moreover, since the regression consists on anticipating managerial frauds before they occur over several time intervals, McAteer (2009) expose the following logit model:

$$P = 1 / (1 + \exp(- (B_0 + B_1 * X_{1(t-y)} + B_2 * X_{2(t-y)} + \dots + B_k * X_{k(t-y)})) \quad (1)$$

Where P is the probability of occurrence, B₀ is a constant, B_i are coefficients associated with independent variables, X_i are independent variables, t is the year of occurrence, and y is the time interval in years.

logistic regression predicts or explains a binary nonparametric dependent variable by determining the probability of independent variables that influence the former variable.

In our context, it is impossible to validate the logit model. Indeed, on one hand the number of banks in our sample is low (10 banks) as well as years of publication of fraud, on the other hand, the number of independent variables is high (18 ratios).

We conducted as a first step the analysis of the t-test between the two groups of observations: a group for fraudulent banks and another for healthy banks. In fact, this test allowed us to determine for each period, the most significant ratios in the detection of fraud. The software used was STATA 10. We developed as a second step discriminant analysis to determine for each year the predictive power of ratios and their classification. We selected for the two groups of banks the period of one year before the occurrence of fraud (t-1), two years before (t-2) and three years prior to its occurrence (t-3). The software used was SPSS 11.

All the ratios used in the Tunisian context are shown in table 1 below.

Table1. Definition of variables

Variable	Definition
Performance ratios	
ASTEMPM	Assets per employee
EEFFR	Efficiency ratio (is a noninterest expenses less amortized intangible asset expenses divided by net interest income and noninterest income)
IDDIVNIR	Cash dividends to net income
IDLNCORR	Net loans and leases to core deposits
INATRESSR	Loss allowance to loans
INLSDEPR	Net loans and leases to deposit
INTEXPY	Cost of funding earning assets (is annualized total interest expense on deposits and borrowed funds divided by the average earning assets)
INTENCY	Total interest income divided by the average earning assets
NIMY	Net interest margin (is the total interest income less total interest expense divided by average earning assets)
NOIJY	Net operating income to assets
NONIIY	Noninterest income to earning assets
NONIXY	Noninterest expense to earning asset
ROA	Return on assets
ROE	Return on equity
ROEEINJR	Retained earnings to average equity
Growth ratios	
ASTEMPM	Assets per employee
EQV	Equity capital to assets
ROLLPS5TA	loans and leases plus securities with a maturity of greater than 5 years divided by total assets
Capital ratios	
EQV	Equity capital to assets
RBC1AAJ	Leverage ratio (is total debts divided by par total equity)

3. Results

The ultimate goal of these empirical tests is to determine the category of ratios and the period that are the best to predict fraud

3.1. T-test analysis

This test aims to compare two samples of banks, one of which is composed of fraudulent banks and the other includes only non fraudulent banks. T- test determines significant ratios that differentiate the two samples. This is to retain the ratios for which we reject the hypothesis of means equality

This test showed that in t-1, there is only NONIIY significant (see table 2). This ratio is defined as Noninterest income to earning assets.

Table 2.T-test analysis in t-1

	Group	Obs.	Mean	P(T>t)
ASTEMPM	0	16	2147448	0.5594
	1	6	2222539	
EEFFR	0	16	0.0102691	0.2540
	1	6	0.007942	
IDDIVNIR	0	16	0.2729323	0.3898
	1	6	0.2327227	
IDLNCORR	0	16	1.086649	0.5930
	1	6	1.106775	
INATRESSR	0	16	0.0163124	0.3822
	1	6	0.128555	
INLSDEPR	0	16	3.904524	0.7920
	1	6	7.397642	
INTEXPY	0	16	0.028145	0.6240
	1	6	0.0289018	
INTENCY	0	16	0.0769692	0.1762
	1	6	0.0737745	
NIMY	0	16	0.0484229	0.1536
	1	6	0.0441507	
NOIJY	0	16	0.0059708	0.6026
	1	6	0.0086611	
NONIIY	0	16	0.023073	0.0046***
	1	6	0.0170855	

NONIXY	0	16	0.0009991	0.2136
	1	6	0.0007524	
ROA	0	16	0.0046609	0.6086
	1	6	0.0074996	
ROE	0	16	0.085645	0.5439
	1	6	0.0891386	
ROEEINJR	0	16	0.0670602	0.5096
	1	6	0.067678	
EQV	0	16	0.0973462	0.2359
	1	6	0.0849406	
ROLLPS5TA	0	16	0.8409135	0.1698
	1	6	0.8342637	
RBC1AAJ	0	16	11.40547	0.4159
	1	6	10.83984	

***Significant at 1% level ; ** Significant at 5% level ; *** Significant at 10% level

In t-2, four ratios are significant: NOIIY, INTENCY, NIMY and NOIJY (see table 3). These ratios are defined as follows:

- Noninterest income to earning assets (NOIIY)
- Total interest income divided by the average earning assets (INTENCY)
- Net interest margin (NIMY)
- Net operating income to assets (NOIJY)

Table 3. T-test analysis in t-2

	Group	Obs.	Mean	P(T>t)
ASTEMPM	0	18	1958401	0.5974
	1	6	2033378	
EEFFR	0	18	0.0091962	0.4656
	1	6	0.0089149	
IDDIVNIR	0	18	0.309471	0.8214
	1	6	0.5115219	
IDLNCORR	0	18	1.064336	0.8888
	1	6	1.106775	
INATRESSR	0	18	0.0120277	0.7889
	1	6	0.138264	
INLSDEPR	0	18	1.064336	0.8888
	1	6	1.166286	
INTEXPY	0	18	0.0316037	0.3360
	1	6	0.0306156	
INTENCY	0	18	0.0813857	0.0279**
	1	6	0.0743637	
NIMY	0	18	0.0490956	0.0631*
	1	6	0.04229438	
NOIJY	0	18	0.0123741	0.0856*
	1	6	0.0068261	
NONIIY	0	18	0.0236244	0.0069***
	1	6	0.017165	
NONIXY	0	18	0.0009336	0.3275
	1	6	0.0008048	
ROA	0	18	0.0094057	0.5632
	1	6	0.0054894	
ROE	0	18	0.0915235	0.2066
	1	6	0.0630773	
ROEEINJR	0	18	0.06253	0.2987
	1	6	0.0462577	
EQV	0	18	0.10072209	0.2041
	1	6	0.0869161	
ROLLPS5TA	0	18	0.8581654	0.5641
	1	6	0.8342637	
RBC1AAJ	0	18	10.75092	0.4827
	1	6	10.6449	

***Significant at 1% level ; ** Significant at 5% level ; *** Significant at 10% level

In t-3, three ratios explain the difference in means between the two samples of banks (see table 4). These are:

- Total interest income divided by the average earning assets (INTENCY)
- Net interest margin (NIMY)
- Noninterest income to earning assets (NOIIY)

Table 4. T-test analysis in t-3

	Group	Obs.	Mean	P(T>t)
ASTEMPM	0	18	1757983	0.5822
	1	6	1816363	
EEFFR	0	18	0.0061542	0.8543
	1	6	0.0089265	
IDDIVNIR	0	18	19.73329	0.5562
	1	6	0.7411827	
IDLNCORR	0	18	1.087526	0.9242
	1	6	1.205104	
INATRESSR	0	18	0.0183481	0.2713
	1	6	0.0121207	
INLSDEPR	0	18	1.087526	0.9242
	1	6	1.205104	
INTEXPY	0	18	0.0317993	0.3069
	1	6	0.0304389	
INTENCY	0	18	0.0822345	0.0047***
	1	6	0.0734254	
NIMY	0	18	0.0496013	0.0375**
	1	6	0.0421945	
NOIJY	0	18	0.0063491	0.5255
	1	6	0.0071268	
NONIY	0	18	0.0239326	0.0274**
	1	6	0.016879	
NONIXY	0	18	0.000672	0.6641
	1	6	0.0007804	
ROA	0	18	0.0034102	0.5802
	1	6	0.0057725	
ROE	0	18	0.609385	0.5999
	1	6	0.0623912	
ROEINJR	0	18	0.0521595	0.6243
	1	6	0.0394183	
EQV	0	18	0.1042716	0.8080
	1	6	0.091609	
ROLLPS5TA	0	18	0.8703851	0.5389
	1	6	0.8729387	
RBC1AAJ	0	18	9.910961	0.5270
	1	6	10.03837	

***Significant at 1% level ; ** Significant at 5% level ; *** Significant at 10% level

We conclude that more ratios are significant in t-2 than in t-1 and t-3

3.2. Discriminant analysis

We classified ratios according to their predictive power in t-1, t-2 and t-3, we obtained the following table:

Table5. Predictive power of financial ratios

Period	Predictive power of financial ratios for fraudulent banks
t-1	66,7%
t-2	66,7%
t-3	50%

Note that details of this result are shown in appendix within tables 6, 7 and 8

Discriminant analysis reinforced by t-test analysis allows us to show that the ratios selected can predict fraud in financial statement of Tunisian banks two years before its occurrence with predictive power of 66.7%. This final result corroborates those obtained by McAteer (2009). In fact, performance ratios predict financial statements fraud of U.S. community banks two years before their occurrences with a higher predictive power of 74%.

4. Conclusion

Undetected fraud in time causes companies an average loss of 5% of annual income (ACFE report to the nations, 2012). It is not an insignificant amount especially if we know that according to the same report Frauds committed by managers and owner/executives generally lasted for two years before they were detected while the median loss among frauds committed by owner/ executives was \$573,000, the median loss caused by managers was \$180,000. Companies, auditors, regulators and many others are in a race to determine the most effective solution or "miracle" to detect and prevent these losses. Researchers try to refine and make more sophisticated models and techniques to circumvent fraud and

its negative impact on company, its partners and economy. In our study of Tunisian banks we showed that a set of performance ratios can be used to predict frauds in the financial statements of Tunisian banks, two years before their occurrences. These four performance ratios above mentioned, are namely NOIY, INTENCY, and NIMY NOIJY

The predictive power of these ratios is important, it is about 66.7%.

The application of this methodology refined by a logit analysis to companies listed on the Tunisian Stock Exchange is possible if the sample of firms is larger and the period is longer.

Appendix

Table 6: Classification results in t-1b,c

FRAUD		Expected class affectation		Total
		0	1	
Original	Number	0 16	0 6	16
	%	0 100.0	.0 100.0	100.0
		1 0	6 100.0	6
Cross-validateda	Number	0 12	4 4	16
	%	0 75.0	25.0 100.0	100.0
		1 33.3	66.7 100.0	6

- a Cross-validation is performed only for observations from the analysis. In cross validation, each observation is classified by functions derived from all other observations.
- b 100.0% of original observations classified correctly
- c 72,7% of cross-validated observations classified correctly

Table7. Classification results in t-2b,c

FRAUD		Expected class affectation		Total
		0	1	
Original	Number	0 18	0 6	18
	%	0 100.0	.0 100.0	100.0
		1 0	6 100.0	6
Cross-validateda	Number	0 15	3 3	18
	%	0 83.3	16.7 100.0	100.0
		1 33.3	66.7 100.0	6

- a Cross-validation is performed only for observations from the analysis. In cross validation, each observation is classified by functions derived from all other observations.
- b 100.0% of original observations classified correctly
- c 79.2% of cross-validated observations classified correctly

Table8. Classification results in t-3b,c

FRAUD		Expected class affectation		Total
		0	1	
Original	Number	0 17	1 6	18
	%	0 94.4	5.6 100.0	100.0
		1 0	6 100.0	6
Cross-validateda	Number	0 15	3 3	18
	%	0 83.3	16.7 100.0	100.0
		1 50.0	50.0 100.0	6

- a Cross-validation is performed only for observations from the analysis. In cross validation, each observation is classified by functions derived from all other observations.
- b 95.8% of original observations classified correctly
- c 75.0% of cross-validated observations classified correctly

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