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ARTICLE

On the nexus between sovereign ratings and financial stability: Fresh insights from Tunisia

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Abstract

In this paper, we attempt to analyze the causal relationship between the financial stability and sovereign rating for Tunisia. To do so, we adopt two-step methodology. We first construct a Financial Stability Index (FSI). Second, we use two models based on different control variables to examine the causal nexus between the FSI and Tunisian sovereign ratings. We construct the FSI using the 11 listed banks during the period 2007-2016. The empirical results show that there are two different phases: phase of financial stability (from 2007 to 2010) and phase of financial instability (from 2011 to 2016) with a significant fall due to indebtedness and inflation's increase. Afterwards, we show that the financial stability significantly affects the sovereign ratings. Such analysis of the causal nexus could be interesting from a policy perspective.

Keywords: Financial stability; Sovereign ratings; Index construction; Banking system; Emerging countries; Revolution.

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1. Introduction

The debacle of financial crises and traumatic country-specific events has attracted a great attention of researchers to re-examine the concept of sovereign default risk. More specifically, many studies tend to update the analysis concerning the Credit Rating Agencies (CRAs) and call into question the widespread reliance on rating given the opacity surrounding the elaboration of credit ratings. A credit rating is considered as a measure of an obligator's level of creditworthiness (Fei et al., 2012). According to Broto and Sanchez (2016), a rating upgrade (resp. a rating downgrade) stems from good (resp. unfavorable) signals in the credit outlook. This ratings update allows to convey timely and accurate information for decision makers (issuers, investors and regulators) and to facilitate private contracting between economic agents (Pangam and Astolfi, 2014). Afterwards, an interesting feature in the field of sovereign ratings is that it integrates two distinctive literature strands. The primary strand seeks to investigate the significant impact of sovereign ratings changes (in particular, rating downgrade). Bernal et al. (2016) classify the sovereign rating determinants[1] into five categories: 1). External and monetary variables; 2). Macroeconomic variables; 3). Public finance variables; 4). Qualitative variables and 5). Default history. In this respect, the literature (e.g. Borio and Packer, 2004) shows no consensus on the role of public finance, monetary and external indicators in determining the

1. Bernal et al. (2016) provide an overview of significant determinants of sovereign ratings.

sovereign ratings whereas many studies (e.g. Eliasson, 2002; Bissoondoyal-Bheenick, 2005) display that macroeconomic indicators have a systematic relationship with the ratings assigned. In this respect, some empirical research show no consensus on the role of public finadnce, monetary and external indicators in the determination of sovereign ratings (e.g. Borio and Packer, 2004; Bozic and Magazzino, 2013) whereas many studies display a systematic relationship between macroeconomic indicators and assigned ratings (e.g. Eliasson, 2002; Bissoondoyal-Bheenick, 2005). Meyer and Mothibi (2021) find a long-run relationship between risk rating index and many macroeconomic indicators such as foreign direct investment, economic growth, exchange rate, lending rates and gross fixed capital formation. Moreover, they put evidence on a bi-directional causality between economic growth and rating index as well as foreign direct investment and the rating index.

As aforementioned, several researchers have increasingly analyzed the factors influencing sovereign ratings and their impacts on stock markets rather than their linkages with the stability of financial systems. Mutize and Nakhalamba (2021) highlight the crucial informative role of credit rating agencies for emerging economies. Despite the huge controversies they triggered with the recent worldwide financial crisis, they remain the best credible source of risk information to access international financial markets. Noteworthily, Athari et al. (2021) profess that financial systems depend substantially on the rating announcements. Cognizant this fact, some researchers have analyzed the nexus between the sovereign credit ratings and the financial system. For example, Bruha and Kocenda (2018) examine the relationship between the sovereign ratings and banking sector quality for the European economies over the period 1999-2014. They indicate that a higher percentage of non-performing debts seems to be the most important determinant. Williams et al. (2012) investigate the effect of sovereign ratings on the credit ratings of financial institutions in 54 emerging countries over the period 1999-2009. They display those sovereign rating downgrades (resp. upgrades) slowly influence rating downgrades (resp. upgrades). Kim and Wu (2008) show that the sovereign credit ratings can increasingly affect the financial intermediary development and capital flows. Boot et al. (2005) report that rating agencies can diminish the financial fragility in two different manners. On the one hand, the agencies' credit watch procedures can decrease monitoring costs. On the other hand, credit ratings can help the investment allocation decision of institutional investors. More recently, Mutize (2021) highlights the negative impact of rating announcements on macroeconomic conditions due to their procyclicality. Motseta and Takawira (2021) find that good ratings influence positively financial development in South Africa, whereas negative ratings make more difficult financing conditions for investors.

This study is related to the literature on sovereign ratings and tries to analyze the causal relationship between the sovereign credit ratings and financial stability in the Tunisian context over the period 2007-2016. Analyzing the causal intertwining between the sovereign risk and stability of financial system in emerging economies matters for a set of reasons. Emerging economies seem to be unstable compared to developed countries and have experienced more dramatic political events which affect the soundness and resilience of the national economy. They also suffer from the inability of their inadequate statistical system to cope with the production of suitable statistics. That is why the Tunisian case may thus serve as a good example of how the revolution substantially affects not only the economic indicators but also the sovereign credit ratings.

From an empirical standpoint, one might use a two-step approach. First, a Tunisian financial stability index is constructed based on three sub-indices: the financial soundness index, the financial development index and the financial vulnerability index. As a matter of fact, we proceed to establish sub-indices to identify and better apprehend different aspects of the Tunisian financial system. The Financial Stability Index (FSI) construction is based on the 11 listed banks over the period 2007-2016. Besides, the analysis covers a period before and after the Tunisian revolution. As well, we convert for each agency the ratings (Moody's and Fitch) scale into a numerical rating score using a linear transformation. We also take into consideration the rating outlooks. Afterwards, we study the causal

nexus between Tunisian sovereign ratings and the financial stability index based on two different models and control variables.

One might contribute to the literature in many ways. First, some challenges related to the causal nexus between the financial stability and sovereign risk are still underexplored and need to be addressed in the emerging (and particularly African) economies. In this regard, the financial system is generally considered as banks-dominated system which play crucial role in Africa's economic development. Such specific framework coupled with the lack of statistical system reliability makes it interesting to investigate such causal linkage. As a matter of fact, and despite widespread attention to sovereign ratings, no previous study has analyzed the link in this manner. Second, this study takes into account the outbreak of political event in analyzing the relationship between the financial stability and sovereign risk. In this respect, it is very interesting to explore the potential dynamics of such link during the political shocks. In this context, this paper complements previous research by studying the possible evolution of causal intertwining between the financial stability and sovereign ratings. Third, we construct composite index of financial stability based on different sub-indices to better capture and apprehend various facets of the emerging financial system. In this regard, we use country-specific measures based on banking activity specific data. Unlike several studies searching only for credit ratings in African countries, we use the rating outlooks in quantifying the sovereign ratings.

The paper is structured as follows. A set of empirical studies, some facts of the Tunisian financial system and the methodology are reported in Sections 2, 3 and 4, respectively. A dataset, descriptive statistics and estimation results are presented in Sections 5 and 6. Section 7 concludes.

2. The financial stability-sovereign ratings nexus: What do we learn from literature?

Since the early 1990s, maintaining financial stability has become the overriding objective of economic policies. That is why many central banks and international financial institutions have endeavored to publish regular financial stability reports. In spite of its importance, there is no common definition of financial stability. Ferguson (2002), among others, rather prefers to define the financial instability based on the three salient facts: (1) a significant divergence between assets' prices and their fundamental values; (2) and/or market and credit availability distortions, on both national and international levels; (3) as a result, significant differences between total expenditures and the economy's production capacity. According to Haldane et al. (2004), the financial instability refers to the financial sector imperfections and corresponds to any deviation from an economy's optimal savings investment plan. Allen and Wood (2006) define a financially stable economy when it cannot become unstable in a context of economic disruption; a financial system is then considered as stable when it can absorb shocks rather than amplifying them. The lack of the common definition of the financial stability coupled with the interdependencies and complex interactions between the financial system and the real economy lead to the absence of the worldwide measure of such concept. In this regard, there are many measures of financial stability such as the Early Warning Systems (EWS), the macro-stress tests, and the financial stability indices.

The advent of the 2008 financial crisis has increasingly raised the importance of the nexus between the sovereign risk and stability of the financial system. From an academic standpoint, many researchers have interestingly investigated the causal relationship between the sovereign ratings and financial stability.

In this regard, the rating agencies can contribute to heighten financial instability through various transmission channels. First, the country's financial situation could directly affect the economic activity and use of the financial services. A sovereign rating downgrade increases the cost of issuing governmental bonds, limiting the country's access to international financial sources. All these actions can curb the economic activity and inevitably the use of financial and banking services. Second, worldwide banks tend to hold substantial volumes of Government domestic debt because of their

safety as reported by risk-based regulation of bank capital. Indeed, public bonds are commonly accepted as guarantee on borrowing markets and by central banks. Bolton and Jeanne (2011) report that domestic European and Japan banks held respectively 15% and 50% of domestic public debt in 2009. Gennaioli et al. (2012) find that government failures are associated with significant contractions in loan supply in countries where banks hold more government bonds. This underlines the importance of the transmission channel between public finance and financial sector. Third, governments tend to support "too big to fail" institutions and prevent their failures. A sovereign downgrade which raises an issue of the government's willingness to support such banks, reduces the collateral value and thus increases investor concerns about banks' payment of interests. Governments are so ready to bail out troubled banks given that widespread bank failures can be very costly in terms of production (Kaminsky and Reinhart, 1999; Dell'Ariccia et al., 2008).

On the other hand, few empirical literature targets to assess how macroeconomic and financial factors affect sovereign bond markets, especially in African volatile contexts. Ahwireng-Obeng (2019) find that domestic and external debts are part of important drivers of sovereign markets evolution in African contexts. Thus, financial institutions (banks, in particular) play a key role in financing investments and boosting the national economy. Therefore, a drop in banking activity leads to investment declines which can slow the economic activity (Gerlach et al., 2010). In this context, the funds for bailout increase government debt and thus worsen sovereign risk (Campolongo et al., 2011; Ahwireng-Obeng, 2019). During the European sovereign debt crisis, many European governments have endeavored to support the banking sector, implying that the banking system tends to be more interconnected with sovereign risk (Asmussen, 2013). Otherwise, financial shocks accentuate adverse selection and moral hazard issues in the markets. This faith crisis leads to a contraction of granted loans and productive investment opportunities given that it becomes increasingly difficult to distinguish between good and bad investments. According to Mishkin (1999), the issue of asymmetric information could entail financial instability due to many factors: the deterioration of financial and non-financial sector balance sheets, the increases in interest rates and financial markets uncertainty. This can worsen adverse selection and moral hazard issues and hence make lenders less willing to lend.

Loans and investments' reduction can engender a recession in economic activity and sovereign ratings downgrades. Reinhart et al. (2000) and Amadou (2004), among others, show that currency crisis helps to predict credit downgrades. That is, there is a closer relationship between a crisis' probability and a sovereign default occurrence. Aktug et al. (2013) analyze the nexus between the banking sector and sovereign risk. They assume that the competitive and sophisticated financial systems are less prone to bank panics. They clearly show that the features of the banking sector (e.g., concentration, liquidity of assets and financial system's size) are substantially related to sovereign ratings. Acharya et al. (2014) analyze the report between the bank's bailout and sovereign risk. Yu (2017) examines the dynamic link between sovereign and European banking CDS spreads over the period 2006-2012. The empirical findings reveal the interdependences between the sovereign ratings and banking sector. In this regard, Yu (2017) shows that the risk transferred from banks to sovereigns increasingly lead to a reversal due to the deterioration of fiscal conditions. De Bruyckere et al. (2013) investigate the contagion between the banking risk and sovereign risk in Europe over the period 2007-2012. They show that banks which are characterized by a small capitalization and a weak financing structure tend to be the most vulnerable to fallout from risks, implying an increase of sovereign risk. Some recent empirical studies focused on the relationship between the sovereign rating and the financial stability in the African context, such as Motseta and Takawira (2021) who find that sovereign ratings have a positive impact on financial variables and help to boost financial development.

3. The Tunisian financial system and sovereign ratings: Some facts

Following the 14 January revolution, the economic and financial environment was downgraded in Tunisia. Indeed, the real GDP growth decreased markedly from 3.1% in 2010 to -1.1% in 2011. The current account deficit increased (from -4.8% in 2010 to -7.5% of GDP in 2011 due to the decease of tourist income. The budgetary deficit also rose from -1% in 2010 to -3.3% of GDP in 2011 because of a fall in budgetary resources and a rise in public expenditures. Exchange reserves decreased substantially to TND 11.3 billion in December 2011 compared to 13.7 December 2010. Nearly all the sectors experienced a downturn over the postrevolutionary period. In particular, the banking sector suffered excessively from under-capitalization and excessive levels of nonperforming loans. These loans account for 13% in 2010 compared with 20% in 2011. As well, the Court of Auditors (2017) in Tunisia questioned the data quality disclosed by the National Institute of Statistics.

Overall, the Tunisian financial sector seems to be small and dominated by banks. The banking sector assets are equal to about 115 percent of GDP in 2011. The banking sector increasingly contributes to finance many economic sectors such as the industrial, trade and tourism sectors. Nonetheless, the banking sector suffers from the lack of competition and low average profitability which reflects a weakness in dealing with operating costs and particularly for state-owned banks. Another issue for the Tunisian banking sector is the important rate of nonperforming loans which is recorded 15% in 2013 (IMF, 2014). Needless to say, such fact reflects shortcomings in the conditions and mechanism of credit allocation. The nonbank financial sector tends to be somewhat low and account for about 20 percent of assets in 2011. In this respect, the Tunisian financial system encompasses a poorly developed insurance system including only 19 (among 21) companies which are specialized in nonlife activities. The penetration rate of insurance in the economy is still weak (from 1.91% in 2008 to 2.1% in 2016). A volume of policies is equal to 1.9% of GDP in 2015. The financial (equity and fixed-income) markets are also small, with a market capitalization of 24 percent of GDP in 2011. The capital markets seem to play poorly in funding other economic sources due to low requirements for the reliability of financial information and the limited number of new products to mobilize private and institutional savings. Although it is considered as young sector in the Tunisian financial landscape, the leasing sector provides different financial services and allows to relay bank financing. It regressed during the four years post-revolution because of unpaid debts and increased capital costs. The penetration rate of leasing sector in the economy is also weak with 10.6% in 2016. Table 1 reports some features of the Tunisian financial system.

The persisting political and instability stemming from the Tunisian postrevolutionary period is accompanied by a set of severe downgrading of the Tunisian sovereign credit rating. The sovereign credit ratings carried out by the four international rating agencies (Standard & Poor's, Moody's, Fitch and Rating and Investment Information, Inc) all range the country among the speculative category. Needless to say, Tunisia has started to be rated for the first time by "Rating and Investment Information, Inc." (R&I) since 1994 due to an issue of bond loan in the Japanese market. Since then, other rating agencies were interested in rating the Tunisia's country risk such as Standard & Poor's in 1997 Fitch and Moody's in 1995. However, since 2011, Tunisia has experienced several downgrades from the three agencies (Fitch, Standard and Poor's and Moody's). In 2014, Tunisia made a decision to temporarily cease the ratings attributed by Standard & Poor's ratings given that it gave Tunisia the worst rating during the past few years. As a matter of fact, Standard & Poor's[2] put it in the highly speculative category with a negative outlook.

Table 1 summarizes some indicators related to different sectors of the Tunisian financial system in order to highlight some features of such system.

2. In this paper, we do not take into consideration sovereign data disclosed by Standard & Poor's given that Tunisia decided in 2014 to temporarily suspend the Standard & Poor's ratings. As well, the R&I ratings are not considered here as many researchers rather prefer to use sovereign ring data from other agencies.

Table 1. Some Features of the Tunisian Financial System

	2010	2011	2016
Banking sector			
Assets Quality			
Nonperforming loans/Total loans	13%	13.3%	15.6%
Financial Performance			
ROA	1.28%	1.08%	1.69%
ROE	10.25%	5.9%	10.9%
Operating expenses/Total loans	46.5%	51.1%	48.5%
Liquidity			
Liquid assets/Total assets	29.8%	26.5%	5.6%
Liquid assets/Short-term liabilities	104.1%	89.4%	94.4%
Deposits/loans	94.6%	87.4%	86.8%
Capital Markets			
Number of listed companies	56	57	79
Market capitalization	$Billion 10.652	$Billion 9.662	$Billion 8.45
Market capitalization (% of GDP)	24.180%	21.091%	20.215%
Stock traded, total value	$Billion 1.836	$Billion 1.051	$Billion 1.741
Stock traded, turnover ratio of domestic shares	17.233%	10.874%	
Insurance Sector			
Number of companies	22	21	22
Insurance equities (TND million)	574.2	710.6	1205.6
Indemnities (TND million)	599.7	709.8	1019.3
Revenues (TND million)	1120.3	1178.6	1679
Leasing Sector			
Number of companies	8	8	8
Leasing operations (TND million)	1438	1174	1790

Source: World Bank; Ministry of Finance of Tunisia; General Committee of Insurances; MAC SA Broker.

4. Methodology

To investigate the nexus between the sovereign risk and the financial stability, it is important to establish the financial stability index for the Tunisian case. The two sub-sections report the set-up of the Financial Stability Index and the econometric models.

4.1 Constructing the Tunisian financial stability index

Following the basic methodology of Albulescu (2009), Albescu (2009), we attempt to establish the so-called Tunisian Financial Stability Index (FSI). It is a composite index which is based on the three following sub-indices: the financial development index (D_t), the financial vulnerability index (V_t) and the financial soundness index (S_t). We have adopted Albulescu (2009) index because it was constructed for the emerging Rumanian context that is similar to the Tunisian one. Also, the financial stability analysis of an emerging country needs to focus on the balance sheet and not on the market data, which is not able to provide reliable short-term forecasts. Another reason to follow Albulescu (2009) methodology is that it relies on the balance sheet data approach which would be more appropriate for emerging economies with a large presence of the banking sector. However, we retain only available indicators for the Tunisian context which highlight the stock market and banks' performance, the credit quality, and the macroeconomic index. To this end, the financial indicators are first standardized and then combined in their corresponding sub-indices using the arithmetic mean (Van den End, 2006). In this regard, Van den End (2006) shows that the difference between the equally weighted indices and those weighted by the econometric framework is insignificant. That is why we perform the equally weighted indices as evidenced in the financial literature. More formally, the sub-indices are calculated as follows:

$$D_t = \frac{\sum_{i=1}^{3}}{3}$$

where D_i corresponds to Market capitalization as a percentage of GDP, the ratio of private credit to GDP and the interest margin ratio.

$$V_t = \frac{\sum_{i=1}^{6}}{6}$$

where V_i corresponds to the inflation rate, fiscal deficit/GDP, current account deficit/GDP, the real effective exchange rate (REER), public debt/GDP ratio and bank credit/deposit.

$$S_t = \frac{\sum_{i=1}^{3} s_{it}}{3}$$

where S_i corresponds to the return on assets (ROA), the banks' financial autonomy (equity/total assets) and the ratio of non-performing loans (nonperforming loans/total loans).

Based on the aforementioned sub-indices, the Financial Stability Index (FSI) is computed as follows:

$$FSI = \frac{3D_t + 6V_T + 3S_1}{12}$$

Finally, the FSI is standardized in order to be compared with its average value. 4.2. The sovereign credit ratings: The case of Tunisia Following Reinhart (2002) and Cantor and Packer (1996), we convert for each agency [3] the ratings (Moody's and Fitch) scale into a numerical rating score using a linear transformation. Indeed, we transform the rating categories into 21 decreasing numerical values which range from 21 (the highest rating) to 1 (the lowest rating). The results of the linear

3. In this paper, we do not take into consideration sovereign data disclosed by Standard & Poor's given that Tunisia decided in 2014 to temporarily suspend the Standard & Poor's ratings. As well, the R&I ratings are not considered here as many researchers rather prefer to use sovereign ring data from other agencies.

transformation of ratings are reported in Appendix 2. We thereafter refine the rating scale by taking into account the possible outlooks disclosed by the rating agencies. Recall that credit ratings (resp. rating outlooks) refer to opinions on the relative willingness and capacity of a debt issuer to fulfil its financial obligations (resp. the eventual sense of credit rating during the intermediate run). Following Correa et al. (2012), we assign an increment of +0.2 (resp. -0.2) for the positive (resp. negative) outlook. Finally, if several sovereign ratings are disclosed in the same year by one agency, one might use the ratings average as the annual sovereign rating. The Tunisian annual sovereign ratings over the period 2007-2016 are reported in Appendix 3.

4.2 The model

We attempt to investigate the causal relationship between the Financial Stability Index (FSI) and the sovereign ratings disclosed by the two rating agencies (Fitch and Moody's). More formally, we estimate the following two models[4]:

$$FSI = \alpha + \beta \begin{cases} \text{FITCH}_{t-1} \\ \text{MOODYS}\ S_{t-1} \end{cases} + \theta X_t + \quad (1)$$

$$\begin{cases} FITCH_t \\ MOODYS_t \end{cases} = \omega + \varphi FSI_{t-1} + \mu X' + \quad (2)$$

where:

- FSI is the Financial Stability Index;
- FITCH and MOODYS are the sovereign Tunisian ratings disclosed by Fitch and Moody's;
- X corresponds to the control variables' Matrix including:
  - M2/GDP (MGDP) is the ratio of the money supply (M2) to the Gross Domestic Product (GDP). It is the financial development indicator and represents the country's liquidity ratio. M2 is an inflation indicator which reveals cash level as well as deposits and savings accounts. The higher the monetization rate is the more financially developed the country is (Ghanem and Achouche, 2015).
  - Reserves/Deposits (RD) reflects the banking sector's capacity to deal with massive withdrawals of deposits. Such indicator is very important to ensure a country's financial stability. Reserves represent guarantees in case of massive deposit withdrawals (Albescu, 2009).
- X': The control variables' Matrix related to the sovereign ratings, including the GDP growth rate (GGR). Afonso (2003), among others, reveals that such indicator has a significant impact on sovereign ratings.

In this paper, we attempt to the linkage between the sovereign ratings and the financial stability through the banking sector's activity. In fact, the banking sector is hugely important to the financing of the Tunisian economy. In 2011, the Tunisian listed banks hold 92.51% of total banking assets, 92.2% of loans and 95.6% of all credit institutions deposits. The data were collected from the Central Bank of Tunisia (TCB) and the World Bank. The sample period covers 2007-2016 during which Tunisia has experienced different events following the 2011Tunisian revolution. We have deliberately restricted our sample period to the year 2016 because our study is tailored to allow for analyzing the causal relationship between the financial stability and sovereign rating for Tunisia with the outbreak of the political events. Such events have spread over the period 2011-2016 and include the revolution, political assassinations (Chokri Belaid and Mohamed Brahmi), terrorist attacks and dissolution of government. Indeed, the country's economic situation was increasingly weakened

4. Following Cantor and Packer (1996) and others, we use first-order lagged variable to better explore the causal nexus of sovereign ratings and financial stability.

by terrorist attacks, political assassinations and the advent of the Libyan crisis. As a result, Tunisia has experienced a substantial deterioration in the financial situation coupled along with successive sovereign ratings' downgrades. This situation adversely affects the ability of the country to find funds in international financial markets. Interestingly enough, it is worth studying the Tunisian financial stability before and after the 2011 revolution.

As aforementioned, we refer to the banking sector's activity as an indicator of the financial stability. It is worthnoting that the banking system contributes to finance many sectors in the national economy such as industry, commerce and tourism sectors. As a matter of fact, the bank loans to the economy reached 77% of GDP in 2016 against an average of 73% during the past four years (the banking supervision report of TBC, 2016). The data comprises eleven listed banks which are: Arab International Bank of Tunisia (BIAT), Attijari Bank of Tunisia (Attijari), Bank of Housing (BH), Tunisian Banking Company (STB), Bank of Tunisia (BT), Arab Tunisian Bank (ATB), International Banking Union (UIB), Banking Union for Trade and Industry (UBCI), National Agricultural Bank (BNA), Tunisia and Emirates Bank (BTE) and Amen Bank (AB). Such financial institutions can be ranged into two groups: Private banks (UIB, Attijari, AB, ATB, BT, UBCI and BTE) and public banks (STB, BH and STB). A snapshot of descriptive statistics of financial indicators is reported in Table 2.

Table 2. Descriptive Statistics of the Banking System's Financial Indicators

	Mean	Standard Deviation	Median	Maximum	Minimum
Total assets	46973269	21887954	44330790	78274590	6730230
Total deposits	34647910	16820618	36178330	63414460	3282250
Total credits	33914279	15955217	30156610	58024460	4708340
Stakeholders' equity	3851978	1361040	4135040	5952390	1361040
GNP	1941312	946017.5	1688280	3934070	243360
Net income	437235	316709.8	448610	976860	27290

Note: All statistics are in Million Dinars (MD).

Table 2 presents a snapshot of descriptive statistics of different variables related to the banking sector to highlight some features of such system.

From Table 2, we report that bank deposits vary between 63414460 Million TND and 3282250 Million TND whereas the average net income is about 437223 Million TND. The volume of loans is generally between 58024460Million TND and 4708340 Million TND, while the equity capital seems to range between 5952390 Million TND and 1361040 Million TND. All these statistics roughly indicate the importance of banking section in the Tunisian economy. The descriptive statistics by bank's financial indicators are reported in Appendix 1.

The FSI indicator is established using constructed based on the three following sub-indices: the financial development index (D_t), the financial vulnerability index (V_t) and the financial soundness index (S_t). The financial development sub-index (D_t) attempts to quantify the development level of the financial system. It encompasses the following three indicators: Market capitalization as a percentage of GDP, the ratio of private credit to GDP and the interest margin ratio. Table 3 presents the descriptive statistics of the financial development sub-index.

From Table 3, the private credit to GDP which reflects the banking sector's depth varies between 57% and 81%. The market capitalization averages 19% of GDP. The interest margin ranges between 2.23% and 3.5%.

For the financial vulnerability index (Vt), the selected indicators cover macroeconomic variables and the banks' financing structure. The vulnerability index measures the financial system resilience to adverse shocks. The selected indicators of the financial vulnerability are the inflation rate, the

current account deficit/GDP, the fiscal deficit/GDP, the public debt/GDP ratio, the real effective exchange rate (REER) and bank credit/deposit. We note that inflation ranges between 2 and 6% over the period 2007-2016. The averaged budget deficit records a value of 3.93% of GDP. The median value of the public debt is about 45.82% of GDP. The mean value of the credit/deposit ratio is about 104.6%. The inflation rate varies between 3% and 6%. The average budget deficit records a value of 3.93% of GDP. The median value of the public debt is about 45.82% of GDP. The credit/deposit ratio reports a median value of 104.6%.

Table 3 presents a set of descriptive statistics of sub-indices to highlight some features of financial system.

The financial soundness index (St) reflects the solvency of financial institutions. The indicators are the ROA, the banks' financial autonomy (equity/ total assets) and the non-performing loans/total loans (the so-called ratio of nonperforming loans). From Table 2, the ROA records a median value of 1.37% over the period 2007-2016 whereas the NPL ranges between 14% and 20.1%. The ratio of shareholders' equity to total assets has a median value of 16.45%.

Table 3. Caption

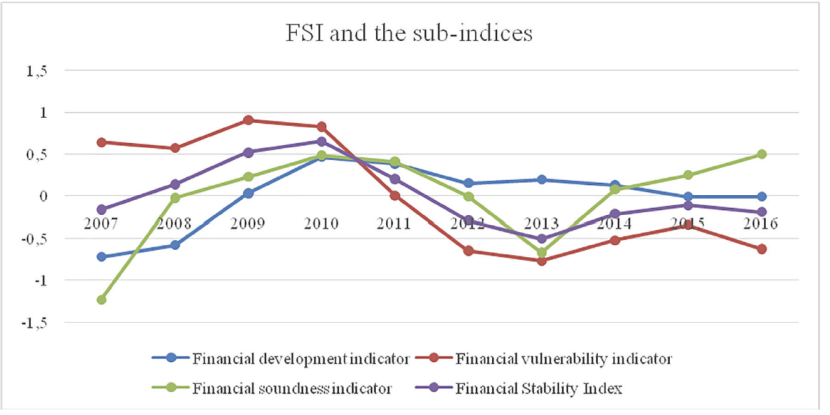
	Mean (%)	Median (%)	Std Deviation (%)	Minimum (%)	Maximum (%)
The Financial Development Indicator (D_t)					
Private credit/ GDP	71.7423	76.3779	8.7409	57.8508	81.1553
Market capitalization /GDP	19.72	20.85	3.3399	13.1	24.1
Margin/Total Revenue	2.9043	2.9543	0.4109	2.23	3.4823
The Financial Vulnerability Indicator (V_t)					
Inflation Rate	4.2345	4.054	0.9175	2.9669	5.8045
budget deficit/GDP	3.93	4.05	2.0505	1	6.9
Current account deficit/GDP	6.47	7.85	2.7109	2.4	9.1
Real Effective Exchange Rate (REER)	98.3144	98.94	2.5932	94.786	101.681
Credit/ Deposit	106.53	104.6	6.2906	99	115.5
Public debt /GDP	47.3555	45.82	7.1278	39.217	60.641
The Financial Soundness Indicator (S_t)					
Return On Assets (ROA)	1.335	0.3116	0.3116	0.6783	1.6921
Equity capital/total assets	7.8617	8.1305	1.0343	5.11	8.543
Non Performing Loans (NPL)	16.49	16.45	1.7572	14	20.1

Overall, there is some heterogeneity between the sub-indices given the different levels of indicators which compose each sub-index. Some indicators really reflect a difficult situation of the economic and financial environment. In particular, and despite the banking sector is very important sector in the country, major challenges lay in such sector. That is why sound government policy through structural reforms is increasingly required to strengthen the banking and financial system.

Figure 1 plots the trends in the FSI indicator as well as all the sub-indices over the period 2007-2016. At first glance, a time-varying synchronization between different indices is well-documented. Most notably, and since the triggering of the revolution, major changes have occurred to the Tunisian economy and financial system. In this regard, and in response to some tragic events after 2010, the different indices clearly show the looming prospects of Tunisian economy and the difficulties faced by the financial system.

During the 2007-2011 period, Tunisia has experienced a financial stability phase. The evolution of the three sub-indices seem to more successfully mimic the Financial Stability Index dynamics and thus markedly closer to the actual evolution of the Tunisian banking system. This is mainly attributed

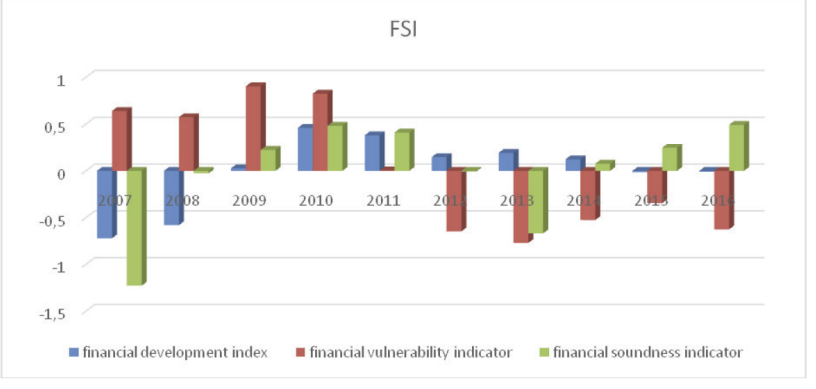
Figure 1: The Evolution of Different Indices



Source: Authors' estimates.

to the improvement of the financial vulnerability's indicators as evidenced by the decrease of the inflation rate (from 5% to 4% in 2009) and the increase of the economic growth rate (more than 3%). The 2008 worldwide financial crisis had no significant impact on the national economy due to the bound intervention of the country in international credit markets and low foreign investment in the Tunisian financial market (24.45% in 2016). This period was also marked by a drop in non-performing loans (from 20.1% in 2007 to 18.2% in 2008) and an increase in banks' deposits by 15.7%. In 2008, the Central Bank of Tunisia reported an improvement in loan portfolio quality through banks' efforts in risk management practices. However, a great fluctuation in the vulnerability index is well-pronounced during this period. This may be due to the increase of banks' foreign currency commitments (to 5.393 Million TND in 2009) along with the devaluation of the exchange rate in the interbank money market.

Figure 2: Decomposition of Financial Stability Index



Source: Authors' estimates.

Nevertheless, the stability index has drastically dropped during the post-revolution period, as evidenced in Figure 1. As a matter of fact, it reached a trough of -0.192 in 2013. The post-revolution is obviously characterized by a political instability coupled with economic and social unrest and other dramatic country-specific events (terrorist attacks and political assassinations). In this context, the commercial bank deposits have significantly slowed (up to 33%), implying a tightening of liquidity. This is overwhelmingly a lack of depositor confidence. As well, the nonperforming loans reached a

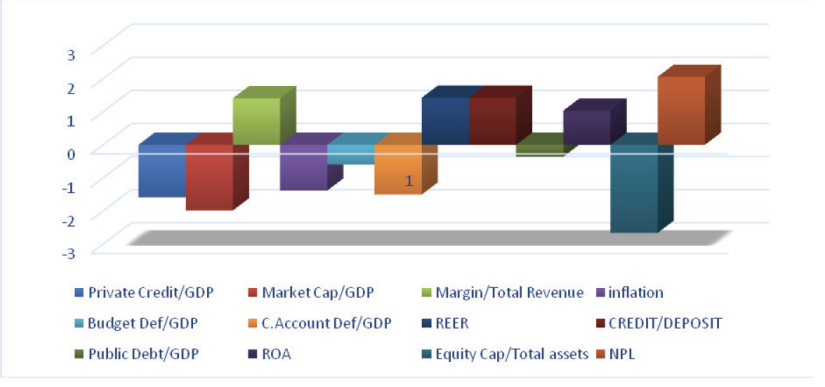
threshold of 16.2% in 2013 against 15.2% in 2012. The EUR/TND and USD/TND exchange rates have significantly deteriorated to 9.7% and 5.8%, respectively. The economic profitability of banks fell to 0.68% in 2013 against 1.12% in 2012.

Figure 2 shows that the financial vulnerability sub-index seems to be the most affected. Most notably, it has reached almost zero due to the worsening of the budget deficit (from 3.5% in 2010 to 1.1% in 2011), the external balance (in particular, the decrease in tourism receipts) and the public debt (which causes 2% of the increase of debt ratio).

From Figure 3, we clearly show that such phase was marked by the decline of the financial vulnerability sub-index. Such salient fact can be attributed to the drop in the budget and current account balance, the increase in public debt, and the credit/deposit ratio that exceeds 100%. This has seemingly resulted in deposits shortfalls to cover the granted credits.

In 2007, policymakers have endeavored to develop new reforms and banking regulations regarding solvency and liquidity which led to foster the financial stability. This can be mainly explained by the two sub-indices of development and financial strength and especially the following three individual indicators: private credit/GDP, market capitalization, and equity/total assets (see Figure 3).

Figure 3: Decomposition of Financial Stability Index



Source: Authors' estimates.

Figure 3 reports the private credit/GDP ratio which reflects the banking sector intermediation. Despite it continuously increases, the private credit/GDP still remains low compared to international benchmarks. The market capitalization to GDP does not exceed 13% due to the lack of stock market development. The ratio of equity to total assets reflects the banking sector's undercapitalization and its vulnerability to deal with financial shocks.

We afterwards report the descriptive statistics of control variables (MGDP, RD and GGR) which are presented in Table 4.

Table 4. Descriptive Statistics of Control Variables

	Mean	Median	Std Deviation	Maximum	Minimum
RD	0.0671	0.06671	0.0021	0.0702	0.0640
MGDP	0.6239	0.6359	0.0518	0.6767	0.5321
GGR	2.54	2.7	2.2495	6.3	–1.9

Table 4 summarizes a set of descriptive statistics of control variables. From Table 4, the ratio of reserves to Deposits (resp. the GDP growth rate) ranges between 0.06405 and 0.0702 (resp. between 0.5321 and 0.6767). The MPIB varied between 0.6767 and 0.5321. The ratio of reserves to deposits averages 0.0671.

5. Estimation results and interpretation

We estimate the two models which investigate the causal nexus between the financial instability and the sovereign ratings using the STATA software. To this end, we use the OLS regression with HAC errors (Newey-West estimators). The estimation results of the model are presented in Table 5.

In Table 3, we report the empirical estimation results of the model across the system of Eqs. (1)-(9) over the period 1998 M1-2017 M4. More precisely, we present the parameter estimates obtained from the maximum likelihood estimation of the corresponding state space model specification. Table 3 is split into two parts: Estimation results of measurement equations (Eqs.(1) to (4)) and estimation results of transition (state) equations (Eqs. (5) to (8)). These different results are discussed in the following subsections. Table 5 reports the estimation results of the first model which analyzes the

Table 5. Estimation Results of the Model 1

FITCH Rating			
Independent variables	Coefficient	Newey-West Std.err	P-value
FITCH $_{t-1}$	0.6524943	0.3248352	0.101
RD	–0.8042804	0.4812891	0.156
MGDP	0.489734	0.6563787	0.489
α	–.1370146	0.3195913	0.686
MOODY'S Rating			
Independent variables	Coefficient	Newey-West Std.err	P-value
MOODYS	0.5269193	0.3206975	0.161
RD	–0.6014248	0.4327222	0.223
MGDP	0.1826767	0.6670545	0.795
ω	–.0634503	0.3018722	0.842
Prob > F = 0.2441			

causal relationship between the Financial Stability Index (FSI) and the sovereign ratings.

From Table 5, we show that there is no substantial effect of sovereign credit rating on future Tunisian financial stability. This clearly shows that the changes in sovereign credit rating have no disruptive influence on the national financial stability.

Table 6. Estimation Results of the Model 2

FITCH Rating			
Independent variables	Coefficient	Newey-West Std.err	P-value
FSI $_{t-1}$	0.8323053***	.0621155	0.000
GGR	0.6094449*	.324423	0.109
α	–.0411934	.2462633	0.873
MOODY'S Rating			
Independent variables	Coefficient	Newey-West Std.err	P-value
FSI $_{t-1}$	0.8244583***	.0789479	0.000
GGR	0.7511766**	.2913784	0.042
ω	–.0154066	.1973795	0.940
Prob > F = 0.0066			

Notes: ***, **, * denote significant level at 1%, 5% and 10%, respectively.

Table 6 presents the estimation results of the second model which analyzes the causal relationship between the Financial Stability Index (FSI) and the sovereign ratings.

Such finding does not corroborate those of previous studies which indicate a significant nexus between the sovereign credit ratings and banking sector indicators and the financing conditions (Correa et al., 2012; Neri, 2013; Mutize, 2021). Nevertheless, our empirical results confirm the findings of Amadou (2009) and Mutize and Gossel (2018) which highlight the limitations of the financial ratings and in particular to anticipate the debt crisis. Table 6 presents the estimation results related to model 2 and a set of tests.

From Table 6, we clearly show that the model 2 seems to be globally significant (Prob > F = 0.0167). The estimated coefficient of the independent variable (FSI) seems to be positive and significant, indicating that the financial stability through the banking sector's activity affects the future Tunisian sovereign ratings. In this regard, the budgetary situation and the banks' balance sheets are closely linked to the sovereign ratings. Such findings corroborate those of Reinhart and Rogoff (2011) and Erdem et al. (2013) that highlight the financial stability and sovereign credit ratings are positively correlated. Therefore, one might confirm that the financial system stability and the good health of the banking system affect the Tunisian sovereign ratings and the State's solvency. In fact, a healthy financial system helps to finance the government's deficit and debts through various tools including the seigniorage[5] which corresponds to the purchase of treasury bills in order to finance the State debts. The treasury bills issued by the Central Bank are bought by the financial institutions and used to finance the state budget deficit.

For the control variable, the estimation results in Table 6 show that the growth rate (GGR) significantly and positively affect the sovereign credit ratings. Needless to say, an increase in economic growth tends to reduce the insolvency problems and sovereign risk. Haque et al. (2006) reveal that the economic variables and country stability tend to significantly influence the changes of sovereign credit ratings. Mellios and Paget-Blanc (2006) display that the most relevant factors in determining the sovereign rating are: GDP, inflation rate and foreign debt.

6. Conclusion

The nexus between the sovereign risk and financial stability has revived the interest of researchers due to the advent of the recent international economic and financial crises. In this regard, the Tunisian case can deserve our attention for several reasons. Since the 2011 revolution year, Tunisia has experienced severe economic and financial conditions along with successive sovereign downgrades. Cognizant these facts, we attempt in this paper to investigate the causal nexus between the financial stability and sovereign credit ratings in Tunisia.

In this respect, the Tunisian financial stability index is constructed using the balance sheet data and financial statements of 11 listed Tunisian banks as well as macroeconomic indicators in order to quantify the vulnerability of the financial system. We collect data from the Central Bank of Tunisia and the World Bank over the period 2007-2016. The estimation results clearly indicate the existence of two different phases: a phase of financial stability which characterized the period 2007-2010, following by a phase of financial recession over the period 2011-2016. This is attributed to the deterioration of several variables such as the budget balance, the current account balance, the credit/deposit ratio as well as the increase of indebtedness and inflation rate.

Biographical notes

Dorsaf Azouz Ghachem is Assistant Professor at the Higher Institute of Management of Tunis and member of Research Laboratory "Governance of Enterprises, Finance and Audit" (GEF2A). She is the author of several publications in indexed journals on financial markets, ratings' announcement effects, systemic risks and financial stability. She has also supervised many master's theses on systemic risk, its

5. The seigniorage consists of the money creation by the Central Bank, serving as a lever for the banks' creation of money.

measures and implications, as well as on financial stability and economic and financial development in the Tunisian context.

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Conflict of interest

We declare no conflict of interest between all authors in this paper.

References

Acharya, V. V., Drechsler, I., and Schnabl, P. (2014). A pyrrhic victory? Bank bailouts and sovereign credit risk. The Journal of Finance, 69, 2689-2739.

Afonso A. (2003). Understanding the determinants of government debt ratings: Evidence for the two leading agencies. Journal of Economics and Finance, 27, 56-74.

Aktug, E.R., Nayar, N. and Vasconcellos, G.M. (2013). Is sovereign risk related to the banking sector? Global Finance Journal, 24, 222-249.

Allen, W. and Wood, G. (2006). Defining and achieving financial stability, Journal of Financial Stability, 152-172.

Amadou, N.R.S., (2009). The Systemic Regulation of Credit Rating Agencies and Rated Markets. Working Paper.

Amadou, N.R.S. (2004). Rating the rating agencies: Anticipating currency crisis or debt crisis? Journal of Banking and Finance, 28, 2845-2867.

Asmussen, J. (2013). Union bancaire et surveillance prudentielle européenne. Revue d'Economie Financière, 112, 37-50.

Athari, S.A., Kondoz, M., and Kirikkaleli, D. (2021). Dependency between sovereign credit ratings and economic risk: Insight from Balkan countries. Journal of Economics and Business, 1-16.

Bernal, O., Girard, A. and Gnabo, J-Y. (2016). The importance of conflicts of interest in attributing sovereign credit ratings. International Review of Law and Economics, 47, 48-66.

Bissoondoyal-Bheenick, E. (2005). An analysis of the determinants of sovereign ratings. Global Finance Journal, 15, 251-280.

Bolton, P. and Jeanne, O. (2011). Sovereign default risk and bank fragility in financially integrated conomies. NBER Working Paper, No.16899.

Boot, A., Milbourn T. and Schmeits, A. (2005). Credit ratings as coordination mechanisms. Review of Financial Studies, 19, 81-118.

Borio, C. and Packer, F. (2004). Assessing new perspectives on country risk. BIS Quarterly Review, 47-65.

Broto, C. and Sanchez, L.M. (2016). Sovereign ratings and their asymmetric response to fundamentals. Journal of Economic Behavior and Organization, 130, 206-224.

Bruha, J. and Kocenda, E. (2018). Financial stability in Europe: Banking and sovereign risk. Journal of Financial Stability, 36, 305-321.

Campolongo, F., Marchesi, M. and De Lisa, R. (2011). The potential impact of banking crises on public finance. OECD Journal: Financial Market Trends. 2, 73 – 84.

Cantor, R. and Packer, F. (1996). Determinants and impact of sovereign credit ratings. Federal Reserve Bank of New York Policy Review, 37-54.

Correa, R., Lee, K-H., Sapriza, H. and Suarez, G. (2012). Sovereign credit risk, banks' government support and bank stock returns around the World. Board of Governors of the Federal Reserve System, International Finance Discussion Papers Number 1069.

De Bruyckere, V., Gerhardt, M. Schepens, G. and Vennet, R.V. (2013). Bank/ sovereign risk spillovers in the European debt crisis. Journal of Banking and Finance, 37, 4793-4809.

Dell'Ariccia, G., Detragiache, E. and Rajan, R. (2008). The real effect of banking crisis. Journal of Financial Intermediation, 17, 89-112.

Eliasson, A-C. (2002). Sovereign credit rating. Working Paper, 1-20. Fei, F, Fuertes, A-M. and Kalotychou, E. (2012). Credit Rating Migration Risk and Business Cycles. Journal of Business Finance and Accounting, 1-42.

Ferguson, R.W. (2002). Should financial stability be an explicit Central Bank objective? Washington: Federal Reserve Board.

Gennaioli, N., Martin, A. and Rossi, S. (2012). Sovereign default, domestic banks, and financial institutions. Working Paper, Universitat Pompeu Fabra.

Gerlach, S., Schulz, A. and Wolff, G. (2010). Banking and sovereign risk in the Euro Area. CEPR Discussion Paper 7833.

Ghanem, Y. and Achouche, M. (2015). Financial development impact on firm dynamic creation: Panel data evidence on MENA countries. MPRA Paper, 68125, University of Library of Munich, Germany.

Haldane, A.G., Hoggarth, G., Saporta, V. and Sinclair, P. (2004). Financial stability and bank solvency. Paper prepared for the Federal Reserve Bank of Chicago International Conference, Chicago, Illinois.

Haque, N.U.I., Manhoman, M.K., Mathieson, D.J. and Mark, N.C. (2006). The economic content of indicators of developing country creditworthiness. IMF Working Paper 96/9.

Kaminsky, G.L. and Reinhart, C.M. (1999). The twin crises: The causes of banking and balance of payments problems. American Economic Review, 89, 473-500.

Kim, S.-J. and Wu, E. (2008). Sovereign credit ratings, capital flows and financial sector development in emerging markets. Emerging Markets Review, 9, 17 – 39.

Mellios, C. and Paget-Blanc, E. (2006). Which factors determine sovereign credit ratings? The European Journal of Finance, 12, 361-377.

Mishkin, F. (1999). Global financial instability framework, events issues. Journal of Economic Perspectives, 13, 3-20.

Neri, S. (2013). The impact of the sovereign debt crisis on bank lending rates in the Euro area. Bank of Italy, Occasional papers, n°170.

Paugam, L. and Astolfi, P. (2014). Determinants and consequences of credit ratings actions during bull vs. bear markets. Working Paper, 1-50.

Reinhart, C. (2002). Default, currency crisis, and sovereign credit ratings. NBER Working Paper Series, 8738.

Reinhart, C., and Rogoff, K.S. (2011). From financial crash to debt crisis. American Economic Review, 101, 1676-1706.

Reinhart, C., Goldstein, M. and Kaminsky, G. (2000). Assessing financial vulnerability, an early warning system for emerging markets: Introduction. MPRA Paper, University Library of Munich.

Van den End, J.W. (2006). Indicator and boundaries of financial stability.De Nederlandsche Bank Working Paper 97.

Williams, G., Alsakka, G. and ap Gwilym, O. (2012). The impact of sovereign rating actions on bank ratings in emerging markets. Journal of Banking and Finance, 37, 63-577.

Yu, S. (2017). Sovereign and bank Interdependencies-Evidence from the CDS market. Research in International Business and Finance, 39, 68-84.

Table 7. Appendix 1: Descriptive statistics of financial indicators by bank

	Median	Mean	Maximum	Minimum	Std deviation
Amen Bank (AB)					
Total assets	6041612	5755093	8242917	2765286	2031941
Total deposits	4053800	3983895	5534662	2072285	1164091
Stakeholders' equity	3999617	3983895	5534662	2072285	1164091
GNB	155454	168828	293863	58491	72360
Net income	62957	97686	249464	29421	76674
Arab Tunisian Bank (ATB)					
Total assets	4457829	4329222	5419872	2743553	853818
Total deposits	3386720	3269894	4082787	2242378	564333
Total credits	2413358	2424772	3654368	1198593	764241
Stakeholders' equity	445026	413504	555032	197468	111024
GNB	152064	154298	212350	100316	33725
Net income	46001	44861	57645	26332	9348
Attijari Bank of Tunisia (Attijari)					
Total assets	4304503	4433079	6868803	2367622	1329577
Total deposits	3453856	3617833	5460301	1941636	1054241
Total credits	3162425	3015661	4477374	4477374	834308
Stakeholders' equity	367750	324958	487696	95697	123529
GNB					
Net income	58110	505317	316878	104784	66423
Bank of Housing (BH)	57999	107077	–9416	31728	
Total assets	5404214	5678719	8240102	3925862	1185809
Total deposits	3560935	3740642	5194082	2443460	856476
Total credits	4218877	4324544	6272654	3067593	894891
Stakeholders' equity	420818	393999	551154	226543	91474
GNB	197131	215228	307524	168931	41593
Net income	50713	27643	92087	–159365	66097
Arab International Bank of Tunisia (BIAT)					
Total assets	7600961	7827459	11334975	4834875	1837313
Total deposits	6049657	6341446	9078305	4096778	1495197
Total credits	5009953	4901836	7678464	2739680	139689
Stakeholders' equity	551709	595239	893750	593636	190142
GNB	369424	393407	593636	228626	112343
Net income	79191	85542	190142	21503	51696

Table 7 Continue...

National Agricultural Bank (BNA)					
Total assets	7419163	7109139	7109139	5051660	1348327
Total deposits	5093375	5183461	5183461	3630123	965966
Total credits	6142653	560002	560002	386856	106825
Stakeholders' equity	565884	560002	560002	386856	106825
GNB	277600	285107	285107	191231	57774
Net income	36584	45016	45016	14553	33138
Bank of Tunisia (BT)					
Total assets	356725	3429739	4718040	2065239	825842
Total deposits	2428726	2389497	3153153	1419783	529033
Total credits	1750748	2722872	3652155	1662590	650364
Stakeholders' equity	516604	531691	729632	360054	114039
GNB					
Net income	647368	166192	235528	115894	37273
Tunisia and Emirates Bank (BTE)					
Total assets	670208	673023	980730	370319	193838
Total deposits	276991	328225	592445	82734	193838
Total credits	276991	328225	592445	82734	179497
Stakeholders' equity	136399	136104	145256	126330	6861
GNB	24014	24336	39752	15663	6793
Net income	2350	2729	8012	–10914	5211
Tunisian Banking Company (STB)					
Total assets	7043668	6849758	8279232	5102021	930214
Total deposits	5207771	4891674	5517309	3608461	635664
Total credits	5410493	5161331	5653418	3822731	578506
Stakeholders' equity	498908	413528	736605	–113823	275572
GNB	243609	244968	309581	206548	28503
Net income	26342	10467	40518	–115453	44083
Banking Union for Trade and Industry (UBCI)					
Total assets	2514000	2395029	3257022	1505303	555445
Total deposits	1808719	1769881	2293655	1073184	388905
Total credits	1895574	1788946	2562093	1078967	481369
Stakeholders' equity	229876	230705	299766	163555	45979
GNB	124050	124566	169355	81983	28827
Net income	23500	23988	31936	12022	6093
International Banking Union (UIB)					
Total assets	3173489	3190336	4660860	1744259	894157.102
Total deposits	2571255	2596253	3661340	1617263	659674.191
Total credits	2889231	2740098	4130691	1315939	880540.357
Stakeholders' equity	110031	151630	371584	–19088	118745.494
GNB	150510	153197	247750	68092	55210.4393
Net income	24959	13141	75798	–179859	68389.2192

(in Million Dinars)

Appendix 2: Sovereign rating transformation

Fitch rating	Moody's rating	Linear transformation
AAA⁻	Aaa	21
AA⁺	Aa1	20
AA⁻	Aa2	19
AA⁻	Aa3	18
A⁺	A1	17
A⁻	A2	16
A⁻	A3	15
BBB⁺	Baa1	14
BBB⁻	Baa2	13
BBB⁻	Baa3	12
BB⁺	Ba1	11
BB^{BB}	Ba2	10
BB⁻	Ba3	9
B⁺	B1	8
B⁻	B2	7
B⁻	B3	6
CCC⁺	Caa1	5
CCC⁻	Caa2	4
CC-	Caa3	3
CC	Ca	2
C	C	1

Appendix 3: The Tunisian sovereign ratings

Year	Fitch Rating	Moody's
2007	13	13
2008	13	13
2009	13	13
2010	13	13
2011	12.3	11.8
2012	11.3	11.8
2013	8.8	9.8
2014	8.8	8.8
2015	9	9
2016	8.8	8.9