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HOUSEHOLD ANTICIPATION AND THE RISE OF BANK FRAGILITY IN THE TUNISIAN CONTEXT

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Abstract

The current paper attempts to explore the effect of Household anticipation on the banking fragility through using the dynamic panel data methods estimated between 2005–2015 on around 18 Tunisian banks. We found that the anticipation is the main factor leading to an increase in the bank fragility. In the long run, the increase in the bank fund has to be accompanied with an increase in the bank fragility. Therefore, the bank fragility rise is more affected by borrowers and investors than depositors and tourist anticipations. Bad economic environment affects more the bank fragility. Those empirical facts therefore support our theoretical findings.

Key words*:*

Non-performing loans; Household anticipations; Dynamic panel data

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INTRODUCTION

Although it is widely believed by the microeconomics classic banking theories that credit markets-is linked to firms practices, and households are first and foremost considered as fund suppliers rather than debtors, households lending has taken a great part in banks‟ balance sheets and other financial intermediaries, as well as in the financial markets‟ operation along with the real economic activity. Moreover, liquidity risk and credit risk are closely linked. Both industrial organization models of banking, such as the Monti–Klein framework, and the financial intermediation perspective in a Bryant (1980) or Diamond and Dybvig (1983) setting, suggest that a bank's asset and liability structures are closely connected, especially with regard to borrower defaults and fund withdrawals. Based on these models, a body of literature has recently evolved focusing on the liquidity and credit risk origin, interaction and the implications for the bank stability. Credit risk and liquidity risk result from creditors and debtors anticipations. Depositors and investors lose confidence in the

bank. They change their doubts about its solvency. They change their anticipations and withdraw their deposits. The bank illiquidity is therefore vulnerability not only to the bank itself but also to the financial and economic system as a whole. The Asian countries financial crisis like Thailand "first crisis of globalization" was amplified by the increased liquidity risk in banks caused by the households and the investors anticipations changes. For instance, one approach, developed in particular by Chang and Velasco (2002) shows that the South Asia crisis resulted from the boom of bank credit induced a significant inflow of capital and followed unexpected withdrawals and cause liquidity problems and, therefore, bank failures in chain (Tirole, 2012). The financial crisis stretched even to other sectors, as well as to the primary sector industries and services.

The Thailand crisis, amplified by the spread household herding behavior is spread to a large part of Asia in 1997 and 1998 strikes Korea, Malaysia, Indonesia and the Philippines (Aglietta et al. 1997). Similarly, the Argentina crisis (1998 and 2002) resulted from the liquidity crisis. Our study contributes to two threads of literature. For the depositors anticipation theories, and liquidity risk, these are the seminal works of Diamond and Dybvig (1983) which have been complete, refined and useful by e.g. Diamond and Rajan (2001), and most recently "random effect" theory (Chang & Velasco, 2000, 2001) . The debtor's anticipations and credit risk studies were based on Leaven & Levine (2009), and Imbierowicz & Rauch, (2014). The remainder of the paper is structured as follows. Section 1 provides the theoretical background for our analysis. It presents a review of the literature related to household and investors anticipations and behavior. It deals with the relationship between liquidity risk and credit risk in banks and bank stability. However, section 2 describes the data including our proxy variables for depositors and debtors' behavior, liquidity and credit risk and presents descriptive statistics and ensures detailed information about the adopted methodology in this paper. Nevertheless, section 3 presents household financial fragility estimates, the conclusion and some useful suggestions for the bank future.

LITERATURE REVIEW

Investors and debtors anticipation and bank fund stability

The changes in investors' anticipations lead to capital flight, a net decrease in the confidence of private creditors; bank withdrawals. Therefore, liquidity risk vulnerability is not menacing only to the bank itself, but also the financial system. Interest in the role of household behavior in the incidence of the liquidity risk on banking fragility. Liquidity risk is banking vulnerability which consequences are: shareholders and bank creditors (depositors, insurance) financial costs and loss of banking industry competitiveness. New challenges are profiled on the horizon and setting evidence of the impact of mimetic behavior of households due to changes in their anticipations about the credit policy are the basis of this research. Despite the ambiguous economic theories according to the deposits behavior role in the bank

liquidity risk, they are due to the household unsteady behavior. It is viewed as a main source of bank variability. According to the "random effect" theory (Chang & Velasco, 2000 and 2001), the bank run is a "self-fulfilling phenomenon" that is not related to the fundamental (switch grass-based models). It is then a self-fulfilling prophecy, and the anticipation is the crisis phenomenon origin.

Related to the information theory "theory based", the bank runs into a depositors' collective behavior. In this case, the depositors are so misinformed. In other banks, depositors are well informed and this would have positive information on their own banks assets. But they may nevertheless withdraw their funds and move them outside the banking system. They ignore their own information and follow the "crowd". So there is a contagion mechanism and "runs" generalized yet on healthy banks (End 2011). Driven by the need to preserve their customer's confidentiality and regardless of the little depositor's information, the bank tried to understand the financial position of the depositors and the withdrawal anticipation (Guttentag & Herring, 1987). In fact, the depositor's runs are related to random events such as the unemployment, which drops the household's real income. Household became unable to save their funds already deposited in prosperity times.

The inflation, the external shock, economic activities turn down, unexpected events are resulting from a poor return, a fear of foreign invasion, an unexpected failure of a large bank in which each had confidence. This makes investors risk more averse. The household anticipations become the focus of both monetary authorities, as economic theories. Confidence is the major deposits stability factor in the bank. Depositor confidence is a phenomenon far too random. It cannot be managed endogenously by banks. For example, during the Argentina banking crisis, Chile and Mexico during the period of 1994-1995, depositors distinguished bad banks and lost their trust in them. They withdrew their deposits as "a bank punishment". Generally, depositors do not give confidence to the bank because they remain uninformed about the bank fund. An intervention of a public agency would ensure the banking system stability ("Deposit Insurance" or "lender of last resort"). Small depositors have neither the means nor the expertise to supervise the bank. They did not withdraw their deposits from their own bank if they have a credible and explicit government guarantee on these transactions balances. Thus, one of the most evident lessons from the current crisis was the need to build insurance mechanisms and means of small deposits. Strengthening prudential regulation is critical to limit moral hazard of banks (Aglietta, 2001). In the same line of idea, Banks liquidity risk is generated not only by the creditor's anticipations but also by the debtors. ... While Diamond and Dybvig (1983) attribute bank runs to the random events result (unstable behavior of the applicants), Jacklin and Bhattacharya (1988) and Chari and Jagannathan (1988) estimate that the bank asset's risk lead to run. In economic downturn, investors expected an ability to

pay back banks loans decrease. Even worse, it leads to the bankruptcy or liquidation of companies and therefore the increase in unemployment. Real household income thus decreases. They cannot repay their debts. The non-performing loans raise has a restrictive effect on the bank liquidity and therefore on the bank stability. Insolvent debtors lead to the bankruptcy. In a situation, a credit shock wide liquidity shock. The bank ability to take new commitments (Aglietta et al., 2009) decreases. A loss of credits prevents also the bank satisfying depositor's demand. Such information, lead to depositors herding behavior (Imbierowicz & Rauch, 2014).

The relationship between liquidity risk and credit risk in banks and bank stability

Classic theories of the microeconomics of banking dealt with banks' liquidity and credit risks. Based on the classic financial intermediation theory, such as the Bryant (1980), and Diamond & Dybvig (1983) models and their extensions (such as Diamond, 1997), and also by the Monti–Klein model of banking organizations. The models propose that, there is a relationship between liquidity and credit risk. The Monti Klein framework and its extensions (Prisman et al., 1986) take borrower defaults and unexpected fund withdrawals, both lead to less bank's income. As other debt funding, equity and bank securities are considered as exogenous, banks generate profits by maximizing the spread between the deposit and loan rates.

At least in theory, the liquidity and the credit risks should thus be positively correlated. This hypothesis is provided by the theoretical financial intermediation literature, as modeled by Bryant (1980), as well as Diamond and Dybvig (1983). Risky bank assets linked to uncertainty about the economy's liquidity requirements lead to bank runs and pure panic (Iyer & Puri, 2012). Consequently, liquidity and credit risk contribute together to the bank instability. Anecdotal evidence from this link during the recent financial crisis of 2007/2008 further supports these theoretical and empirical results, such as Acharya & Ouarda (2012), Klomp & Haan, (2015), and Schroth et al., (2014). If the bank assets deteriorate in value, more depositors will expect the losses of their fund and they will withdraw them. The main result is that the higher credit risk goes with higher liquidity risk through depositor anticipations. A very recent and still developing monetary literature as Acharya & Naqvi (2012), Ponce & Rennert (2015) propose that the liquidity risk is negatively correlated to credit risk.

BACKGROUND ABOUT BANK FINANCIAL FRAGILITY

From a theoretical perspective, the link between liquidity risks resulting from depositor's anticipation and credit risks from inventor's anticipation seems to be clearly proved. These episodes give rise to a question: *how do the economic actors' anticipations affect the bank's fragility?* We describe the literature clearing up financial distress. Banks fragility studies contributed in clarifying loan commitments (secured and/or unsecured, i.e. mortgages and/or consumer credit). In this research area, when we investigate literature about household, investors and financial fragility, this phenomenon was considered as one's inability to repay financial debt (Guglielmo al.,

2014). Then, based on a self-reported indicator of financial distress, Del Rio & Young (2005) investigated unsecured household debt, resulting from investors or households' anticipations, and proved that they have indebtedness difficulties revealing a given personal bankruptcy rate (Dick & Lehnert, 2010). As a result, subjective measures of financial distress are linked to other indicators extending the probability of indebtedness default (Del Rio & Young, 2005).

In addition, the empirical findings revealed that the ratio of unsecured debt to income is assumed to be a distinguished factor determining financial instability. The unsecured young households' debt raise combined with a high debt–ratio was due to the household's potential financial shocks that their anticipation change is based on their income and also on the increase in interest rates. In short, the indebtedness anticipation and financial vulnerability are a multidimensional phenomenon which requires an analytical analysis allowing discovering its major and hidden causes. With regard to households‟ indebtedness and financial vulnerability, we will present, in the following section, our adopted methodology, the description of the major targeted variables, and also the results and interpretations of the estimated Tunisian households.

METHODOLOGY, RESULTS AND DISCUSSION

Descriptive statistics

The main variable deals with the household and borrowers anticipations. The database covers 18 banks observed between 2005-2015. These banks represent 80% of the whole banking sector, and would serve to analyze the household's anticipations and financial fragility. The household deposits and credits are taken from the Tunisian Central Bank (TCB). It is worth mentioning that household behavior and attitude change considerably over the period 2005-2015, as indicated in Figure 1.

This justifies the legitimacy of investigating these noticeable cross-bank differences which are dependent on the rate of household lending and borrowing. The latter affects the bank stability. In short, Table 1 presents the bank specific variables used in the econometric analysis and their corresponding specific hypothesis. After reviewing the main specific variables as factors of the bank fragility, it sounds interesting to empirically validate our hypotheses in the case of the Tunisian Banking system.

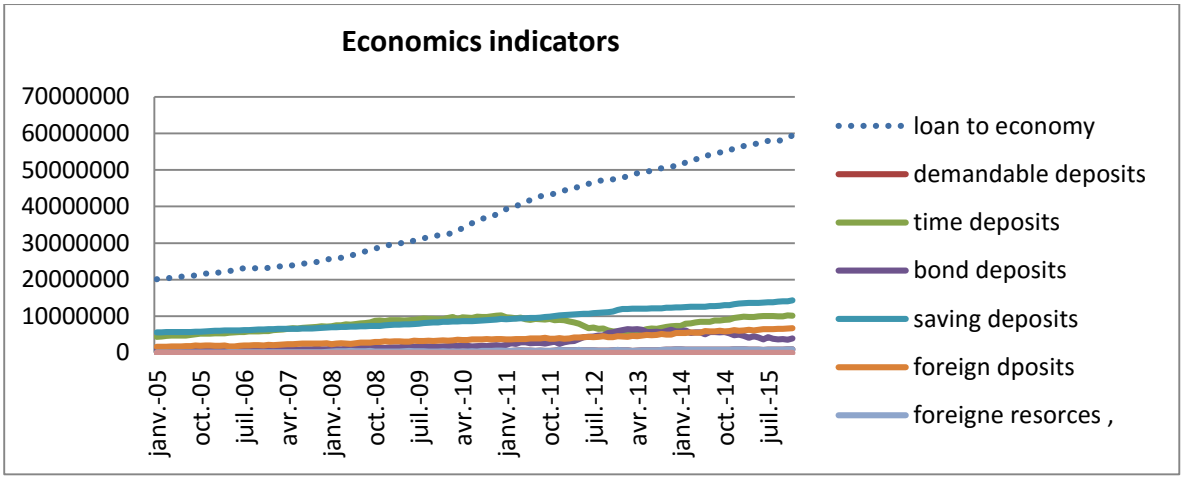

FIGURE 1. BANK RESOURCES AND ABILITIES EVOLUTION

Time series histogram

TABLE 1. THE DESCRIPTIVE STATISTICS OF THE VARIABLES

	Bond deposits	Demandable Deposit	Foreign deposits	Loans to the economy	Foreign currency	Savings depsosits	Time deposits	TUNIDEX	NPL
Mean	2768749	488877.5	3702337.	37324510	488877.5	9240152.	7773652	3790.755	40852369
Median	1888500.	487984.5	3628185.	35817457	487984.5	8689673.	8052045.	4404.290	55646507
Maximum	6468500.	982245.0	6731338.	59423725	982245.0	14352231	10231836	5718.940	75287654
Minimum	807500.0	39871.00	1657779.	20108166	39871.00	5591951.	4353439.	1312.330	10105874
Std. Dev.	1869426.	285345.7	1446508.	12649907	285345.7	2697963.	1709235.	1292.931	22649907
Skewness	0.657195	0.058989	0.453014	0.205244	0.058989	0.323689	-0.294858	-0.454393	-0.236651
Kurtosis	2.919237	3.803180	3.158110	3.589412	3.803180	2.734813	1.764642	3.811183	2.369214
Jarque-Bera	15.92619	7.954638	8.413151	11.87043	7.954638	11.10888	10.30630	12.31548	7.258251
Probability	0.000348	0.018736	0.014897	0.002645	0.018736	0.003870	0.005781	0.002117	0.006541

In the current paper, we consider a panel of eighteen Tunisian banks. Table 1 presents the descriptive statistics of households' NPLs for all eighteen banks and the variables included in our empirical analysis. The results show that the average of NPL of the studied sample is about 40852369. The minimum value of the recorded ratio of NPLs is 10105874 while the maximum is 75287654. Although the average rate of household's NPLs is high, the banking sector in Tunisia is still characterized by a high level of NPLs.

Clearly, all variables average is positive and std. dev. scalar is high during the period. In addition, demandable deposits, foreign currency, loans to the economy, tunindex market have kurtosis values that are higher than three. They are also the most volatile factors exhibiting the highest positive Skewness and having the Kurtosis excess. This implies that the distribution has a long right tail and is relatively peaked to the normal. Therefore, it is worth noting that these variables are risky as they can take extreme values. Thus, the Jarque-Bera test indicates that the normality assumption is rejected for all factors. Furthermore, checking the stationary, the results from the P value tests indicate that series are not stationary. Henceforth, those econometric characteristics let us conclude that most time series are volatile over the time.

Time series decomposition

Decomposition technique is a method for decomposing time series into permanent and transitory components. Note that this method, unlike traditional methods, considers the trend as a stochastic process. The Hodrick–Prescott filter is useful to time series decompositions for the analysis. Each time series is decomposed to trend and cycle (Norden, 2004).

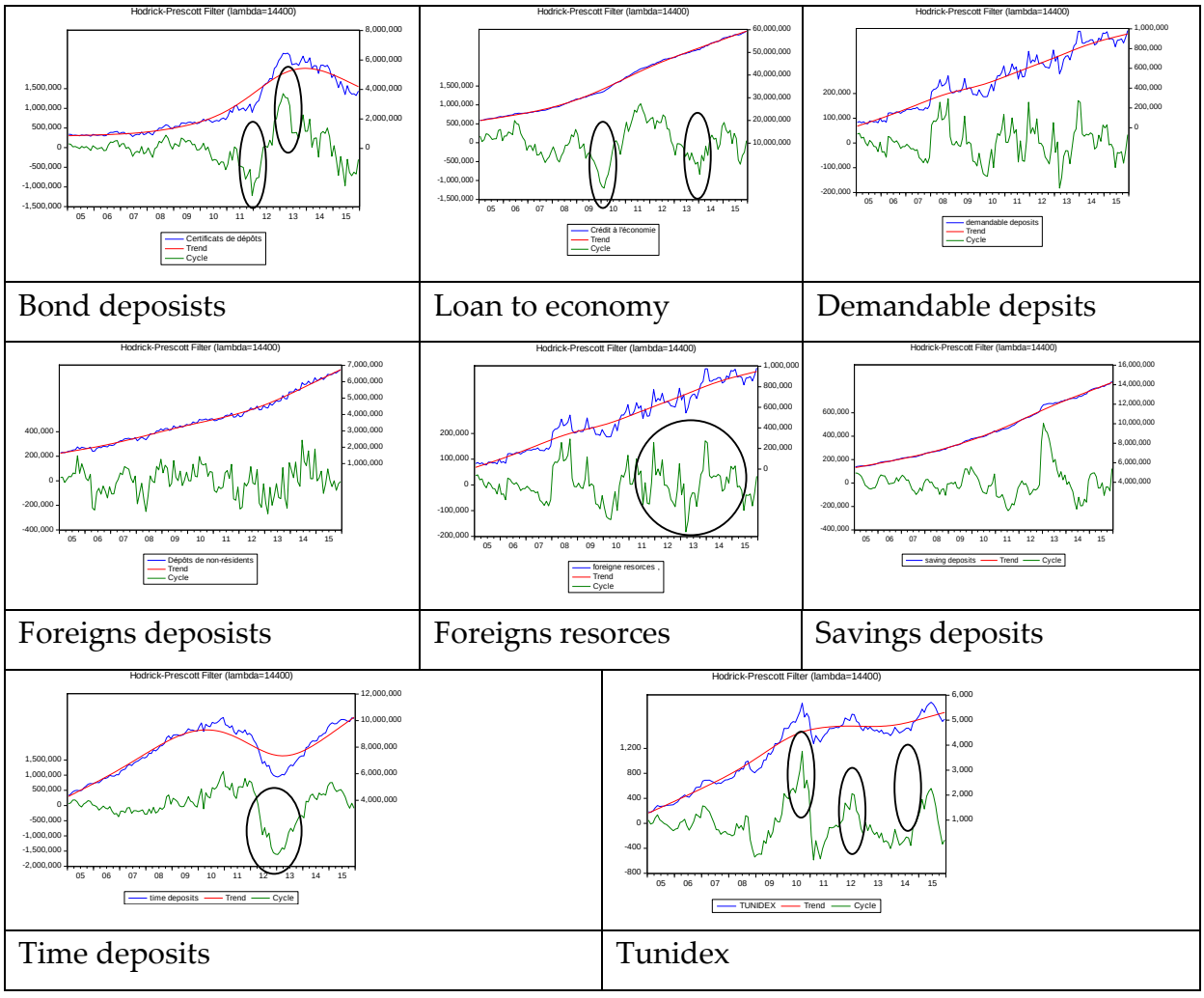

FIGURE 2. TIME SERIES IS DECOMPOSITION

Bank's deposits are the main bank resources. These funds, deposited by the resident and non-resident household, can be withdrawn directly from the bank. Such behaviour can be underscored by the decomposition of deposits series. Bond deposits, foreign resources, saving deposits and time deposits HP trend curve tends to increase with almost volatilities after the revolution event. They show some peck in 2011 (revolution) 2013 and 2015 (Period of election, Sousse terrorist attack). The significant variability of deposits, which is relative to the average lefts, affirms the random effect

of these resources. The Foreign currencies are the second bank resources. In 2009, variability increased and peaked. The figure below suggests that foreign currency assets and foreign investor's anticipation change. The long term trend of foreign exchange earnings increases. The trend shows a slight decrease towards the end of the period (2010). In 2010, the situation has completely changed. The growth rate of currency plumping was due to internal and external economic factors. As the internal factors are concerned, the new political climate in Tunisia became unstable from the end of 2014 and thus had a combined effect on tourist anticipations and incomes.

On another level, the tourism sector has experienced a stagnation of entries by non-residents. Based on the histograms study and Hodrik Prescott filter, we can conclude that the Tunisian household behaviour is different in time. There are two periods: ordinary times and times of crisis. In ordinary times, the variability of the deposit growth rate is not a major problem since the fluctuations are dawdling. These can result from a seasonal behaviour which is usually approximate. However, in a household environment disturbing event (revolutions, economic crisis, terrorist attacks ...), these variabilities have large amplitudes. They become recurrent and unexpected. Besides, the kurtosis coefficient of different deposits is greater than 3 for deposits, deposit certificates and foreign deposits. Therefore, it is worth noting that demand deposits, deposit certificates and non-resident deposits are risky as they can take extreme values. If the household or foreign depositors meet a slight shock (unemployment, unexpected expenses ...), it withdraws deposits and foreign deposits. For other deposits (term deposits and savings deposits), the kurtosis coefficient is less than 3. The occurrence of extreme values for these deposits is rare.

Despite its unsteadiness, bank's savings remain a risky funding, since fluctuations increase more than decrease. This proves the realism of the Tunisian household and its rational anticipations as proved by Niinimäki (2002). If the household anticipates a slight shock, he will withdraw demandable and foreign deposits. If the shock anticipated becomes important, they will withdraw time and savings deposits. This rejects the Diamond and Dybvig (1983) conception and joined the information theory "based theory". Following the logic of this theory in Tunisia, the well informed household has positive information about the assets of his own bank, is interested in the different vulnerability in the country such as the revolution post period event (political event, terrorist attack....). In case of unexpected events (a bad return, poor economic situation, an unexpected failure of a large bank in which each had confidence) he anticipates a pessimist position and withdraws his funds (time deposits and savings) and redeposits them when the situation acclaims. They do not take into account their own information and follow the "crowd". The bank runs in Tunisia are not considered as self-fulfilling prophecies within the Diamond and Dybvig (1983) approach, related to the stochastic nature of withdrawals but they are related to hazards. The bankers and the monetary authorities aim is the investigation of factors that affects the household behaviour and change their anticipations, mainly

small depositors. The last period was marked by social turmoil and bad information about political corruption and the failing economic conditions (Barnea, 2015). According to Allen & Gale (2007), Roman & Sargu (2014), proposal, these withdrawals are random, and are not considered as self-fulfilling prophecies. As a result, the deposit convertibility suspension does not resolve the problem of bank run. The bank must find other alternatives for managing its liquidity problems. Banks need to protect depositors by a mechanism such as deposit insurance as well as the last period. The structure of deposits is based on demandable deposits. Banks tend to borrow short term, because short-term debt is less expensive than long-term debt (different interest rates). According to Rodrik & Velasco (1999) the maturity of the external debt of banks explains the self-fulfilling panic. Tunisian banks should encourage long-term deposits, at the expense of short-term, to serve as a financial basis to be distributed as loans.

Concerning currency resources, while the long term trend of foreign exchange earnings is rising, it drops from the end of 2010, 2014 2015. These resources also exhibit a seasonal pattern. Similarly, the coefficient of kurtosis, which is greater than 3, shows a probability of occurrence of distant values of the average. These resources are strongly linked to changes in the banking environment and thus to the foregone household anticipation. Similarly, fluctuations from one year depend on the movements of the previous year. The impact on these resources is amortized over several periods. This confirms the instability of these resources. They are strongly related to customer behaviour resulting from the economic and environmental factors. The loans to economy curve exhibit an upward trend especially from 2009. Foreign Direct Investments grew, but at a slower pace than in 2005. The cycle curve fluctuated in particular from 2009, when economic system was dominated by the political system. The public banks, with few deposits, had been, for the 23 years a source of funding for the former political regime.

Among 175 companies dominated by the president's family, almost a third (56 companies) is financed by the Tunisian Banking. Tunisian household became more averse to waste their found. Investors cannot repay credit. The curve has high peaks in 2014. This is due to the political election and some terrorist attacks that affect the investor's anticipation. The Tunindex curve shows two periods. The first was steady until 2010. The second is very fluctuant until 2015. This is due to the financial market liquidity which is closely linked to the political and economic externalities. In Tunisia, the market is illiquid as well as embryonic and this is usually considered as a sign of a non-developed financial infrastructure. As a conclusion, banks resources and liabilities are unsteady, insufficient and vulnerable to negative externalities which have become the main characteristics of the Tunisian banking environment that affect the economic actors anticipations such as depositors or borrowers . Given such

situation, a legitimate question in what is the link between liquidity shortage and credit risk?

HOUSEHOLD FINANCIAL FRAGILITY ESTIMATES: RESULTS AND INTERPRETATIONS

In this section, we propose to check whether the household and investors as defined in the previous section, affect the banks financial fragility. Fragile banks are reluctant to make new loans (Andrianova et al., 2015b). Instead, they focus their efforts on deleveraging their balance sheets and strengthening their liquidity buffers in order to cope with deteriorating depositor confidence (Lagoarde-Segot & Leoni, 2013). Thus we approve Non Performing Loan growth rate as bank fragility indicators. We study data from 18 Tunisian banks during the period of the first quarter of 2005 to the fourth quarter of 2015. Panel data sets for economic research possess several major advantages over conventional cross-sectional or time-series data sets (Schularick et al., 2011) taking into account the unobserved heterogeneity between banks. To our best knowledge, this might be the first study dealing with this topic in the Tunisian context.

Econometric Model Presentation

To explicate the Tunisian bank fragility, the following econometric model has been applied:

$$TCNPL_{it} = \alpha TCCE_{it} + \beta\, TCD_{it} + \infty TCFC_{it} + \gamma TCTUS_{it} + e_{it}$$

TCNPL: is the growth rate of the NPLs household ratio per bank,

TCCE, TCCD, TCFC, TCTUS: is growth rate of bank credit, deposits , foreign currency, market index

e = error term

TABLE 2. UNIT ROOT TEST RESULTS, IPS (2003)

	Without trend	With trend
LTCNPL	4.266	-1.852
Δ TCLNPL	-22.987*	-21.963*
TCCE	-1.654	-1.151
Δ TCCE	-16.358*	-16.987*
TCD	1.987	-1.258
Δ TCD	-23.951*	-23.702*
TCFC,	-1.658	-1.247
Δ TCFC,	-19.987*	-17.963*
TCTUS	2.587	-1.368
ΔTUS	-26.365*	-25.258*

Note. * significant at 1%; ** significant at 5%; *** significant at 10%

These represent the model's basic variables, as generally applied in the literature, in order to clarify the Tunisian bank financial fragility. In fact, we assume that the NPLs behavior constitutes a dynamic process as its previous level well might explain the present one. NPLs at time captures the cumulative amount of the prior periods of

NPLs. Beside; the current TCNPLs ratio will certainly influence the banks' credit policy, and proves the borrower anticipation and inability to repay credit when he is pessimist. Therefore, it changes their future financial conditions‟ behavior and, so, the NPLs ratio. As a result, this proxy goes with the literature (Andrianova et al., 2015b; Loayza & Ranciere, 2006). Before proceeding with our model estimation, the unit root test needs to be conducted as a preliminary step. 6.1.1 Stationarity-Analysis Test the results from the IPS (2003) unit root test are listed in Table 2.

By applying this test on all the variables, in-level and in a first-difference, we notice that variables are non-stationary at a threshold of 5%. Equally, series, which lagged one period, are stationary. Then, as all series are integrated in the same order I(1), we turn to test the possibility of an existing long-term linear relationship between these variables. This could be accomplished through applying a cointegration panel test. At a primary-difference step, the unit-root hypothesis appears to be rejected for the all variables. As a conclusion, one can notice that the whole panel series turns out to be integrated at an order of 1, as previously stated by the IPS (2003) statistics.

Panel Cointegration Test

The cointegration concept could be defined as a systematic long-term co-movement between two or more economic variables (Wagner & Wied, 2015). In this section, Johansen (2014,) cointegration test is applied to prove the existence of a long-term relationship among the TCNPLs ratio and its determinants. The results of the cointegration test are presented in Table 3.

TABLE 3. COINTEGRATION TEST RESULTS, JOHANSEN (2014)

Without trend		With trend	
Tests	Statistics	Tests	Statistics
Panel ν Statistics	0.22	Panel ν Statistics	0.28
Panel ϱ Statistics	-1.54	Panel ϱ Statistics	- 1.95
Panel pp Statistics AD(PP)	-2.73	Panel pp (PP) Statistics	-1.54
Panel Statistics	1.54	Panel (ADF) Statistics	0.68
Panel ϱ Statistics	2.98	Panel ϱ Statistics	1.98
Panel (PP) Statistics	3.54	Panel (PP) Statistics	1.02
Panel (adf) Statistics	1.41	Panel (adf) Statistcs	0.08

All statistics reject the no-cointegration null hypothesis since there exists a cointegration relationship between the indicator of bank financial-fragility (non-performing loans) and of the fundamental variables. Overall, Table 3 proves the existence of a cointegration relationship between the TCNPL and the fundamental variables that were cited below. According to the econometrical approach, and in presence of panel data, such a relationship can be further estimated by resorting to the Full Modified Least Square (FMOLS) method, as developed by Pedroni (1999).

Estimation of the Cointegration Relationships

It is worth highlighting that the fact of applying Pedroni's (1999) test would only serve to check the extent to which a cointegration relationship exists between the bank non-performing loans and the applied variables. Once these tests confirm the cointegration of variables, the FMOLS estimation method could then be used. Applying the cointegration test on panel data requires the adoption of an adequate estimation method. Accordingly, a variety of methods can be distinguished. Among these, we may cite, for instance, Pedroni's FMOLS, the Dynamic Least Square Method (DOLS), the Generalized Moments Method (GMM), and the Maximum Likelihood (ML). Several authors, such as Phillips and Moon (1999) demonstrated that, in the presence of panel data, the FMOLS and DOLS methods lead to normally-distributed estimators. Moreover, Pedroni (1999) showed that the Least Square Method estimators are considered as super-convergent and that their asymptotic distributions are biased and depend on the nuisance parameters. The author also states that these problems could be noticed due to the presence of heterogeneity. The model estimation results via FMOLS are presented in Table 4.

TABLE 4. COINTEGRATION VECTOR ESTIMATION VIA FMOLS

Bank	Variable	Coefficient	t-statistic
All banks	LCE	2.05871	9.98772
	LD	-4.258745	3.258741
	LFC	- 1.236547	1.987452
	LTUS	- 1.258745	2.365478

Table 4 highlights the long-term relationship binding the TCNPL s to the f variables with regard to fundamental Tunisian banks resources and liabilities. Across all regressions in this section and subsequent sections, the coefficients of the ratio of none performing household loans are largely consistent with our expectation. For instance, the coefficients on deposits, currency and tunidex are negative and statistically significant, suggesting the probability of falling into long-term payment defaults. This proves that the households' bad anticipations can be the main bank disturbing factors and vice versa. Thus, the Tunisian and foreign households' anticipations and mimetic behavior can be serious banking problems, and then, to financial fragility (End 2011; Jappelli et al., (2008). The households' financial after revolution becomes even more precarious just as it is the case when the assets' value with regard to liabilities for most households, as any decrease in their incomes jointed to high index prices, would certainly affect their real income. Household and foreigner anticipate more and more distressing prospect. Turning to credit, the coefficients on TCCE are positive and statistically significant in general, confirming that credits are bad and banks with bad asset quality are prone to fail. Results suggest the go down of firm and household debt-reimbursement capacity, hence increasing their financial fragility. In fact, the household, foreigners and investors anticipations provide a real view about the reasons of economic and financial distress, and therefore, about the importance of this

fact which reflects that a high debt level could yield well serious financial problems (Anderloni, 2012). However, and with respect to our case study, this variable wasn't shown to be significant. This could be explained by the fact that we are dealing with gross disposable income per capita. Furthermore, the real interest rate also appears to have a positive and significant impact on the household non-performing loans. When referring to the existing empirical literature, we find that the link between the real interest rate and the non-performing loans" ratio is positive. In this context, Bofondi & Ropele (2011) have demonstrated that an increase in the real interest rate would immediately result in an increase in the debt charge, generating a high increase of risky and doubtful installment reimbursement(i.e unpaid credits) and hence, a rise in household financial fragility. As for the last stage, the focus is on estimating the assessment of the error-correction model in the short term

Sensitivity Analysis: Estimating The Panel Error-Correction Models

For the sake of robustness checks, we apply the econometric dynamic panel techniques in order to estimate and evaluate the error-correction models (ECM), as applied in our sample. Indeed, the ECM model is represented by the following equation:

$$\Delta TCNPL_{it} = \alpha_i \Delta X_{it} + \gamma_i (TCNPL_{it-1} - \beta_i X_{it-1}) + e_{it}$$

Where:

$TCNPL_{it}$: the fragility indicator of bank i in year t,

X_{it} : the exogenous variables" vector of bank$_i$ in year t,

$TCNPL_{i,t-1}$: the indicators of the fragility of bank fragility $_i$ for the year $_{t-1}$,

$X_{i,t-1}$: the vector containing the exogenous variables" set of bank i in year t-1,

λ_i : adjustment coefficient.

δ_i et α_i the estimated parameters,

i = 1,2,…..N designates the banks, and t = 1,2,….T designates time.

Prior to treating the long-term relationship, the error-correction model is achieved in order to ensure the integration of the short-term fluctuations. In order to estimate the ECMs' indicator of bank fragility with the pertinent explanatory variables, we apply the Pesaran et al., (1996 and 1999) approach. In this respect, three major techniques are worth to be adopted since they are expected to secure the estimation of the ECMs in the panel:

1) the dynamic fixed-effects estimator' (DFE),
2) the pooled mean group estimates (PMG), and

3) the mean roup estimates (MGP).

With respect to our case study, we have opted for the DFE estimation technique (Note 3). The global sample ECM estimation results are illustrated in Table 5.

TABLE 5. ECM DEPENDENT VARIABLE: Δ TCNPL

Variable	Coeff.	Std Error	T-Stat.	Signif.
Constant	-2.363	0.587	-10.852	0.000
Δ CE	1.258	0.054	12.951	0.000
Δ FC	2.987	2.369	-0.987	0.258
Δ TUS	-0.987	0.895	0.951	0.587
Δ D	0.358	2.369	2.587	0.002
RESIDS (λˆ)	-0.951	0.058	-9.987	0.000

The ECM estimation results show the short-term relationship which exists between the endogeneous variable and the exogeneous ones. Indeed, the estimated ECM adjustment coefficient (λ ˆ=-0. 951) proves to be negative and significantly different from zero at 1% level. Moreover, the obtained results highlight that this adjustment coefficient appears to be statistically and significantly negative, proving the existence of a long-term equilibrium relationship between the households' NPLs and the other variables. In the same way, the coefficient of Tunindex is negative and non-significant in the long run, whereas the foreign currency, deposits appears to bear a positive and significant. Such effects are hard to perceive in the short run, owing to the fact that a long time period is necessary for an eventual complete full shock transmission to take place. Therefore, the deposits and foreign currency appear to have a negative and significant effect in the short term but negative in the long-term estimation. Hence, one can deduce that the rise in the deposits and foreign currency cannot resolve the non-performing loan problem. Therefore, driven by the need to raise the non-performing loan, bank must not only increase its fund, but the optimal resources use. Household anticipations affect short term bank fragility.

Furthermore, the coefficient on credit to economy is positive and statistically significant. These results further confirm the crucial role of bad management and bad investors or borrowers' anticipations in bank failures. In short, one might notice that the in-panel ECM estimation corroborates and confirms the test results achieved by DD (1983). This shows that the model takes into account the anticipation main factors leading to an increase in the bank fragility. Indeed, the model has proved that, in the long run, the increase in the bank fund has to be accompanied with an increase in the bank fragility. This indicates that the increase in bank fragility is more affected by borrowers and investors anticipations than depositors and tourist anticipations. Bad economic environment affects more the bank fragility. In addition, an increase of credit risk affects more and more liquid risk. The customer split is a solution for doubtful accounts: A bank with a diverse portfolio (individuals, local authorities, associations, farmers, SMEs, multinationals ...) should use the customer's segmentation. Before giving credit or engaging in project financing, banks should

carefully analyze the financial situation of their customers. This will ensure their solvency to reduce the amount of bad loans on bank balance sheets. The asymmetry of information between the customer and the bank is still behind this failure. Indeed, companies are looking to improve their image to the bank in order to satisfy their financial needs. The banks cannot be strict with their loyal customers. The bank may find another way to control its customers (credit applicant or applicant) by holding in the capital of customers companies. Indeed, when banks take a part in the customer's companies and are shareholders, they can be aware of their customer's solvency. The Tunisian banks should conduct a stricter policy of covering. Moreover, the Tunisian bank manager should be more professional and vigilant, more careful in the decision to give credit (Central risks, central bank). Similarly, the introduction of prudential regulation, as regards the management of bank liquidity was necessary to save the financial system from excessive risk-taking of a given bank. However, prudential norms fail to reduce liquidity risk. The information asymmetry between the legislator and the manager remained behind the liquidity shortage in Tunisian banks. Recurrence of banking and financial crises can only validate this assertion.

CONCLUSION

To conclude, the purpose of this paper is to study Household anticipation and the Rise of Financial Fragility in the Tunisian Context. Our database consists of 18 banks the 2005–2015 period. To address potential endogeneity problems, we estimate our models by dynamic panel data.

Firstly, we have applied the unit root test of Im, Pesaran and Shin (IPS, 2003) for dynamic panel data, which eliminates the risk of discovering any fallacious regressions.

Secondly, we have resorted to the error-correction and cointegration tests of Pedroni (2004), which ensure the fact of checking the long-term equilibrium dynamic relationships among the variables in our model.

The detection of a cointegration relationship between the bank fragility indicator and the fundamental variable has provided an undeniably interesting advantage at the practical level. These results confirm the findings of Andrianova et al., (2015b), Lagoarde-Segot & Leoni, (2013). In order to ascertain our results' reliability and robustness, we have primarily opted for the use of the ECM models. The main results have proven that the adjustment coefficients are negative and statistically significant, thus highlighting that the ECM actually confirms and corroborates Pedroni's findings (2004).

Our findings have important implications for banking authorities. They may induce policymakers to reduce the danger in order to preserve the financial system from a

particular bank excessive risk-taking and focus on the interactions between liquidity risk and related systemic risk, as a macro-prudential approach part.

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