The Impact of Taking into Account Information Asymmetries and the Credit Market Structure in the Assessment of Borrowers' Credit Worthiness: Case of Tunisia

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Abstract: We attempt to assess borrowers' credit worthiness in three scenarios one heralding prevalence of information asymmetries the second heralding absence of information asymmetries and the third a realistic scenario encompassing both features for the sake of determining which one gives the best outcome in terms of goodness of fit and adequacy of the model specification with the corresponding market structure of the credit market in purview.

The added value of this research is that, when we want to estimate any entity, the explanatory variables carrying market imperfections must be manifested and not implicitly invocated because of the endogeneity of market imperfections and the market structure should be specified clearly; otherwise, the estimation is inadequate and the empirical results do not correspond to the theoretical predilections.

In other words, the conformity of empirical results with theoretical predilections does not rely on the absence of information asymmetries, whose full recognition does not introduce spuriousness into empirical results.

The research is a comparative cross investigation of scenarios highlighting the best fit to borrowers' Creditworthiness assessment and deducing through logical analysis the role payed by information asymmetries and the banking market power in shaping this fit.

Keywords: Information asymmetries, Market bargaining power, credit risk, borrowers' creditworthiness, Investor risk apetite.

INTRODUCTION

The issue of Financial instability attracts much concern in the literature because besides resulting in obstructions for credit production and investment financing and by a way of consequence economic performance, it creates a hindrance to financial balances that might trigger the outburst of a financial meltdown.

Besides, according to the financial accelerator theory and the super-multiplier theory, financial imbalances propagate magnified to the real economic sector which means that a key determinant of financial stability or instability which is borrowers' credit worthiness for the banking sector plays a prominent role for economic performance considerations especially for a country like Tunisia that suffers from economic slowdown and absence of indications of economic growth.

Having stated this, disrespectfully of the relevance of borrowers' credit worthiness to financial stability and economic performance, the issue of information asymmetries which is supposed to exert a prominent effect on the assessment of borrowers' credit worthiness is of prominent relevance due to the fact that it introduces bias into the subjectivity of the computation of the figure expressing borrowers' credit worthiness and the adequate modeling of it as many autoregressive dynamic lagged models can fit the goodness of fit provided empirical results correspond to theoretical predilections.

The issue of information asymmetries intervenes in many aspects of the assessment of borrowers' credit worthiness, in its expression as well as in its modeling.

Therefore, in order to find a way out of the hindrances its implications might result in it is of prominent relevance to consider several scenarios that would enable to weigh its impact on the goodness of fit of borrowers' credit worthiness modeling indirectly through showing which scenario factual or counterfactual among well fitted models verifies correspondence between empirical results and theoretical predilections, fact that would show which scenario is more realistic and permits to put inference on the effect it exerts on the relevance of the modeling.

The notions of investor risk appetite, the effect of NPLs on excess credit demand or rejected credit, the output gap and Non-performing loans are key features fathoming borrowers' credit worthiness from the banking sector standpoint.

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Modeling borrowers credit worthiness with the banking credit risk aspect of determinants expressing riskiness of credit allocated leads to an information asymmetry bias that detriorates the borrowers credit worthiness measurement and modeling ability to fit a realistic assessment with a credit risk measure that might be considered as misleading because it holds implicitly information asymmetries such as agency costs or adverse selection along with free riding for credit screening or more precisely scoring.

It also neglects expected significance of non performing loans contrariwise to commonsense and expected significance of effect of non-performing loans on rejection of credit demands which is also not commonsense. Whereas, for the second counterfactual scenario, modeling borrowers credit worthiness with the investor risk appetite aspect of determinants that is obviously compromising for borrowers credit worthiness instead of credit risk performs far better in terms of compliance with theoretical predilections as it is verified empirically in accordance to descriptive statistics and commonsense that borrowers' credit worthiness is negatively autocorrelated, besides non-performing loans and the effect of non-performing loans on credit rejections coefficients are statistically significant.

Unexpectedly for the realistic scenario credit rating or the assessment of credit worthiness at the banking sector level is counter-cyclical with the business cycle phase contrariwise to what should have been expected. Indeed for most empirical references it is pro-cyclical. This means that in our framework, during economic downturns, credit worthiness assessment by the banking sector or credit rating is loose whereas during upswings it is tight.

This is confirmed through an assessment of the impact of credit market structure on cyclicality of borrowers' credit worthiness with the business cycle that shows that for monopolistic competition in the absence of bargaining power credit worthiness is countercyclical to the business cycle phase.

The first scenario is counterfactual and regresses borrowers' credit worthiness on credit risk for the banking sector, NPLs and OG. The second scenario is also counterfactual and regresses borrowers credit worthiness on investor risk appetite, NPLs, OG and the effect of NPLs on credit rejection.

The third scenario is the more realistic and corresponding to actual practice and heralds interestingly insightful empirical findings that fit at best the realistic purview of modeling borrowers credit worthiness at the banking sector level.

This article also shows an essential and contributive feature of modeling borrowers credit worthiness with the function of the sensitivity in that, unexpectedly, borrowers credit worthiness or credit rating at the banking sector level is countercyclical with the business cycle phase which means that it penalyses borrowers for economic upswings since expecting future downturns afterwards and makes borrowers benefit from an economic downturn by easing the tightness of credit rating by expecting future upswings that come afterwards which is tributary of sensitivity modeling intended at grasping incremental effects in a prospective forwardedly guided fashion.

This means that this expression in the form of elasticity is forwardedly guided and utile for forecasting far better than scoring expressions that besides holding information asymmetries are retrospective in their time dependent sightedness.

The three scenarios are intended to shed the light on the impact of information asymmetries on the assessment of borrowers' credit worthiness through a deductive methodology rather than an inductive one.

The objective of the research paper is to show that taking into account asymmetric information is essential for empirical modeling to be compliant with economic theoretical predilections although they introduce a bias of assessment into the modeling as both counterfactual alternatives (exclusively taking asymmetric information into account and not taking at all asymmetric information into account) do not fit a realistic overview of what really occurs.

All these results have revealed for the third scenario to be in compliance with theoretical predilections and validate the motivation of the research according to which including into modeling items comprising asymmetric information that are of prominent relevance for the subject matter is essential for empirical modeling to be compliant with economic theoretical predilections although they introduce a bias of assessment into the modeling.

The rationale lying behind is that both counterfactual alternatives do not fit a realistic overview of what really occurs. In other words, empirical findings for them are not compliant with theoretical predilections for the case of ARDL short run dynamics.

Hence, compliance of empirical findings with theoretical predilections is not relying on absence of information asymmetries whose full consideration does not introduce spuriosity into empirical results. Contrariwise skipping determinants comprising information asymmetries introduces spuriosity that weakens the goodness of fit and makes empirical finding not compliant with theoretical predilections.

The reference to sensitivity based expressions of items that are referred to qualitatively in the relevant literature is very contributive and provides insightful ways to provide analytical modeling for qualitative issues.

This method is deemed to provide the merits to highlight accurately the role played by a key notion through multiple scenarios analysis.

It could be applied to any item related to information asymmetries as it is obvious that information asymmetries cannot be grasped by a variable therefore its impact should be grasped through deduction and induction through logical analysis affordable with this kind of three scenarios analyses.

In the following section 2 reviews the literature on the subject matter firstly about he macro and micro determinants of borrowers creditworthiness then for the determinants of borrowers credit worthiness and purview of two scenarios drawing a wedge between the case of information asymmetries and the case of sound assessment of credit worthiness:

Section 3 scrutinizes the borrowers' credit worthiness specificities and cyclicality through descriptive statistics

Section 4 is about the research methodological approach adopted which is the ARDL

Section 5 is about empirical findings that remain not clear up to a certain point and require more theoretical fundamentals that we find in section 6 about the credit market structure that help explain more concisely the empirical findings of section 5 with the effect of monopolistic competition on the bargaining power of involved actors then we conclude in section 7 and summarise.

2. LITERATURE REVIEW

There is abundant literature claiming that the cost of borrowing takes information asymmetries into consideration and that they increase it.

Still we raise a debate about the rationale underlying taking into account information asymmetries in risk premiums and the setting of the cost of borrowing as they are endogenous in nature and already taken into account implicitly in aggregated.

We raise a concern under the scope of this research about borrowers' credit worthiness which is key to credit risk assessment.

We find logical evidence that information asymmetries should be taken into consideration in borrowers' credit worthiness assessment if not empirical findings of its modeling are not in compliance with theoretical predilections.

The motivation of the subject matter stems from the fact that disrespectfully of the relevance of borrowers' credit worthiness for banking performance and te risk of non performing loans and the ensuing threat for financial stability, it still stands that the assessment of this figure is subject to citicism due to the effect information asymmetries exert on its key features namely credit scoring, credit risk and eventually its computation per se.

At the forefront of this issue stands the market imperfection of information asymmetries as being a major hampering issue bridging a gap between the requirement of accurately assessing borrowers' credit worthiness and the drawbacks of the tools at hand for the banking manager or the prudential authority.

Not only borrowers' credit worthiness when assessed from a macroeconomic perspective draws a wedge with the issue of financial stability contrariwise to a single borrower's macroeconomic perspective but also still the issue of information asymmetries is closely linked and tributary to the macroeconomic aspect of the assessment of borrowers' credit worthiness as portrayed by the scoring techniques that herald most of information asymmetries such as free riding and adverse selection as will be shown according to the relevant literature whereas a macroeconomic perspective under several circumstances can be void of information asymmetries and therefore provide a more concise assessment of borrowers' credit worthiness especially whenever aspects such as credit market structure, market power and investor risk appetite are included in the modelling in order to provide a realistic overview of the factual determinants of borrowers' credit worthiness again provided its functional expression is a good fit of what it is expected to represent.

The issue of Non performing loans is of prominent relevance for the assessment of borrowers' credit worthiness firstly because it is a clear signal of the threat borrowers might represent for banking performance and financial stability and secondly because the figure is void of information asymmetries because it is computed without reference to a subjective judgment that might incur information asymmetries.

According to Podpiera and Weil (2008): "From the 1990s up till the early 2000s a large number of banks in emerging economies collapsed owing to high non performing loans and worsened cost of efficiency.

This indeed was observed in balance sheets of banks in both emerging markets and advanced economies where NPLs were found to be major bottlenecks to their profitability".

According to Abiola and Olausi (2014) and Richard and Al (2008): "The failure of effectively monitoring non performing loans or reduce high levels exceeding set thresholds may lead to insolvency."

Biabani and Al (2012) added "when a relatively large number of banks have NPLs surpassing their capital, banks crisis can follow which in the long run leads to a financial crisis".

Thus the root threats to financial stability are fathomed through a quantitative assessments of NPLs credit risk and borrowers credit worthiness at the banking sector level which lead us to adopt the perspective of the banking sector aggregates and data to assess credit worthiness rather than at the individual bank or borrower.

The concept of information asymmetry was first posited in the seminal work of Akerlof (1970) in which the paper claimed that the existence of uneven dissemination of information between transacting parties resulted in an imperfect market.

According to Stiglitz and Weiss (1981): "Information is imperfect and obtaining information can be costly. The extent of information asymmetry is affected by the actions of firms and individuals".

Kemei and Korengo (2014) attributed high non performing loans in banks to lack of information.

Dell'aricca (2001) noted that "if the banks could effectively determine the Creditworthiness of borrowers deserving borrowers could get the credit facilities thereby reducing the high rate of loan default.

Conversely an adverse selection exposure whereby high risk borrowers displace Creditworthy borrowers could cause deterioration in overall bank loan portfolio leading to a buildup of NPLs".

Literature of Reference on Creditworthiness Assessment

In the referred to literature, borrowers' credit worthiness is accounted for either through microeconomic underpinnings pertaining to individual banks assessments mainly used to evaluate borrowers and decide on credit allocation or through macroeconomic underpinning assessing a certain type of borrowers which is mainly concerned with international assessments for the sake of allocating development credit:

The Microeconomically Founded Approach is Essentially Based on Scoring

Scoring from a banking management perspective is computed for individual borrowers.

This method has got both merits and drawbacks.

The merits are based on their practical appliance for the microeconomic underpinnings of individual banking management to avoid falling in the hindrance of the adverse selection or agency costs information asymmetries.

This is achieved by collecting available data on the past performance of the borrowers with other banks in terms of refunding credit or credit rating institutions.

But this method bears the drawback of falling in the hindrance of another information asymmetriy which is free riding.

As a matter of fact disrespectfully of the past performance of the customers in terms of credit worthiness basically his credit worthiness with respect to the project which is due to finance by credit is more dependent on an appraisal of the feasibility of the project than on previous performance of credit worthiness of the customer.

Therefore the method of scoring is practical in terms of individual bank management but makes the

researcher or banking manager fall in the hindrance of avoiding accounting for one information asymmetry to fall in the hindrance of accounting for another.

The Microeconomically Founded Approach

In the relevant literature there are many methods of evaluating and analyzing credt worthiness. According to Normamolovich (2020); «the problem of the approaches to evaluate credit worthiness is that they focus on statistical assessments rather than estimates calculated for future periods, while the bank must make a credit decision the result of which can only be estimated in the future».

The complex analysis of the scoring model is microeconomically founded and bears many drawbacks with respect to its retrospectivity and imbedded information asymmetries.

Loan rates are computed on the basis of risk premiums that are dependent on risk notation of credit risk tributary on scoring as stated in Anvarovich (2022) according to whom: « There are several types of scoring that can not only assess the credit worthiness of a client but also provide information about the status of the loan repayment depending on the financial condition of the client after receiving the loan. In our opinion, the use of credit scoring systems by commercial banks in the allocation of certain types of loans to individuals can give positive results ».

Credit scoring is a kind of rating assessment; a technical method proposed in the early fourties by the American scientist D Duran for the selection of borrowers on a consumer loan.

This scoring model combines an assessment of credit risk, business risk and credit history risk.

The credit risk and credit history risk introduce bias into the assessment process in that they bear information asymmetries such as free riding and agency cost besides the fact that they are retrospective meaning they take historical computations that might not matter for the future that is prospective.

The Macroeconomically Founded Approach

The macroeconomically founded approach is mainly concerned with qualitative response statistical modeling like LOGIT and PROBIT modeling with two outcomes in the regress and credit worthy or credit unworthy.

This method is prospective. It does allow for forwardedly guided assessment. But, it bears the main drawback of not presenting detailed outcomes such as how far is credit worthy as it has only two outcomes 1 and 0 with one standing for credit worthy and zero standing for credit unworthy and the determinants coeffcients standing for the log odds.

McKenzie (2002) has studied the credit worthiness for customers (borrowing countries) of the international bank for reconstruction and development through panel LOGIT analysis and undertook the same analysis for the Paris Club.

He analysed the degree of commonality in the determinants of default across credit groups.

Disrespectfully of his finding, we convey a special concern about his methodological approach that tries to asses borrowers credit worthiness based on qualitative response models that perform well in terms of the prospective feature of analysis but presents the drawbacks of not qualifying how far do countries represent a credit worthy or unworthy customer.

Aylward and Thorne (1998) addressed repayment performance to the IMF using the same methodology meaning a qualitative response model PROBIT.

Procyclicality and Countercyclicality of Borrowers Credit Worthiness with the Business Cycle Phase

Jun Kyung Auh (2013) estimating by a PROBIT model firms' credit quality using a Markov MCMC method within the framework of a macroeconomically founded approach like the one adopted in the framework of this research finds that although rating agencies claim their rating policies are countercyclical, empirical evidence and computations show that they are indeed procyclical and by a creation of counterfactuals he distinguishes the economic impact of the procyclical rating policy on firms' performance.

Appraisal of the Adopted Computation of Borrowers' Credit Worthiness and Research Methodology

According to the FSA federal savings association in the Rating credit risk controllers handbook (2001):

«The risk rating should be dynamic; in other words, rating should change with risk change».

This feature is a major drawback for scoring that is widely adopted and based not only on government

rating agencies data that infer an information asymmetry bias by introducing free riding asymmetry but also are usually static in the meaning they do not adjust once accounted for to the change in risk.

This major drawback is circumvented by our adopted methodological approach in a comprehensive manner. As a matter of fact our method accounts for an assessment of rating firms' behavior with respect to the impact of the cost of borrowing on their willingness to perform or their accounting for non performing.

This method is neither static nor information asymmetries bearing and measures the soundness of investors response to the modifications in cost of borrowing in terms of their ability to perform or reinburse their loans.

This is seemingly a sound technique to mesure borrowers' credit worthiness and allows for rating investors or borrowers according to the effect of modifications in the cost of boorowing on their ability to refund their loans.

The expression of elasticity of NPLs to borrowing rates is used as a proxy for the borrowers credit worthiness and is deemed to express at best this figure in the absence of a clear measure of credit worthiness.

It steps aside information asymmetries as imbedded in scoring and measures a behavioral aspect of borrowers in terms of sensitivity to increases in borrowing rates constituting a burden to fathom the extent of serious management and risk taking of borrowers and whether there is moral hazard as involved by imprudent borrowers that as long as they consider only expectations of success and not probability of success they do not care about cost of capital and their npls are related rather to business environment rather than cost of capital they have henceforth npls insensitive to borrowing rates whereas those whose npls are sensitive to borrowing rate are not deemed to be assessed at the fate of luck but financial management issues with realistic expectations most likely to occur meaning that the expectations of profitability are fair and its probability is high.

This measure which is e(NPL/Lr) is a sound proxy for borrowers credit worthiness because it is a signal of the extent of matching between the true risk entailed by borrowers and the computed risk encompassed in risk premiums accounted for in loan rates. It measures the matching between risk premiums accounting for the risk taken into consideration by banks and the actual risk as being implicit in the measure of non performing loans.

If this elasticity increases this means that as risk premiums increase, NPLs are more sensitive to borrowing rates which makes borrowers more credit worthy and most of borrowers credit worthiness accounted for in risk premiums. Banking rating is not random or is strongly correlated with project expected profitability. There is precise rating and risk notation.

If this elasticity decreases this means that as risk premiums increase, NPLs are less sensitive to borrowing rates which makes borrowers less credit worthy and most borrowers credit worthiness not accounted for in risk premiums. Banking rating is random or weakly correlated with project expected profitability. There is a bad rating and risk notation.

Our method consists in taking borrowers credit worthiness into account from a banking sector perspective for the scope of enhancing credit sector resilience to systemic risk and financial instability.

In doing so, based on a sensitivity analysis approach, we try to interpret the sensitivity of Non performing loans to the average cost of borrowing and find out it is a fairly performing benchmark on the seriousness of the borrowers in terms of predisposition to refund the loan.

It is based on the reference in the literature about the qualification of the sensitivity of borrowers to high borrowing rates according to which borrowers should not accept high borrowing rates if not they are not willing to refund the loan.

The elasticity of non performing loans to loan rates represents an expression of the sensitivity of NPLs to loan rate increases.

It is an expression of the quality of investors selection with respect to the average cost of borrowing.

As a matter of fact, if investors are more sensitive in NPLs to increases in loan rates they are good quality investors meaning that they are not likely to incur higher borrowing costs and neglect the likelihood of non repaying their loans.

The stake of risk entailed by their financed project is accurately taken into account by the risk premium.

If investors are less sensitive in NPLs to increases in loan rates they are deemed to be bad quality

investors meaning that they are likely to incur higher borrowing costs and neglect the likelihood of non repaying their loans.

The stake of risk entailed by their financed project is not accurately taken into account by the risk premium. Because of adverse selection borrowers have the tendency not to repay their loans whenever borrowing rates increases do not affect their expected ability to repay the loans.

The more NPLs are elastic to borrowing rates or risk premiums the more investors are good quality investors.

This method is prospective in that it is geared toward future assessment to be valid for expectations about the impact on financial stability in the future. It is not based on historical assessments bearing information asymmetries such as free riding by taking future qualifications based on past assessments although it is based on time series regressions forecasts take actual and future determinants into account in the equations.

Determinants of Borrowers Credit Worthiness and Purview of two Scenarios Drawing a Wedge between the Case of Information Asymmetries and the Case of Sound Assessment of Credit Worthiness

Essentially, what should be prevailing according to commonsense and economic reasoning is that e(NPL/lr) or borrowers credit worthiness should be negatively autocorrelated which means that increases in this elasticity leads to ulterior decreases in it. Or in other words the quality of investors is shrinking.

The fact that it is negatively correlated means that the elasticity in this time period affects negatively the elasticity at the next period so the shape of the curve should be showing alternations of upswings and downturns in the pattern of borrowers credit worthiness.

Main determinants of NPLs with respect to borrowers are either the borrowing rate or macroeconomic conditions or the feasibility of the projects.

Bad quality borrowers are those with the worst feasibility of project.

Therefore their likely NPLs are assumed to be very responsiveness and sensitive to feasibility of projects and macroeconomic conditions rather than sensitive to borrowing rates.

Therefore, e(NPL/Br) is low for bad quality customers of the banking sector whenever they are private firms.

Good quality borrowers are those borrowers for whom NPLs are more responsive and sensitive to macroeconomic conditions and Borrowing rates than sensitive to feasibility of projects.

Therefore good quality customers of banks which are private firms have e(NPLs/Br) high.

The quality of credit demand for the banking sector by customers other than households (in terms of agency costs and risk exposure).

There are low risk of non performing private investment activities whose profitability depends on market share and output fluctuations inside the business cycle like Manufactural producing entreprises, Food producers, Agricultural producers

Those are good quality private customers.

There are also high risk of non performing private investment activities whose profitability depends on their market share and economic growth Like services electronics research and development.

The elasticity increases for good quality investors that are sensitive to the impact of cost of debt on NPLs.

The elasticity decreases for bad quality investors that are not sensitive to the impact of cost of debt on NPLs.

After an increase in the borrowing rate, disrespectfully of the probability of non performing loans or actual non performing loans if npls are not sensitive to incremental variations in borrowing rates investors are of bad quality in terms of credit risk exposure for the banking sector because their credit demand is insensitive to increases in the probability of npls. This kind of non aversion or neglect for risk of default further exacerbates their incoming credit likelihood to repay. Mostly their credit demand is also insensitive to increases in borrowing rate. They are operating in uncertain activities have high expectations of mass future cash inflows and thereby incur à high risk among which being insensitive to NPLs and the risk that banks sell off their collateralised assets. They

are Indeed too optimistic about future cash inflows that in most cases do not realise and They lose the calletral which the bank sales at a high discount with the increase in loan rate barely repaying the principal it disbursed.

This is a main hindrance to financial stability either from the bank credit exposure side or the asset market side that losses its value abruptly.

The adopted measure of credit risk in sensitivity formulation is the willingness of the banking sector to bear excessive risk or the sensitivity of new credit supply to the private sector to the money market rate variations.

This expression assumes implicitly that credit supplied has been subjected to screening through scoring.

This process of risk assessment and notation is undoubtfully subject to information asymmetries like adverse selection or agency costs and free riding or collecting data on borrowers for free from banking data institutions disrespectfully of the prior assessment of the feasibility of the projects to be financed by credit.

Therefore credit risk computed this way has imbedded in it implicitly all aspects of information asymmetries taken into account and biasing therefore its ability as a measure to step aside information asymmetries.

This Indeed as will be shown will reveal compromising for the validity of taking it into account in assessment of borrowers credit worthiness as it is expected to lead to misspecifications and unrealistic empirical results.

Contrariwise investor risk appetite is more eligible to measure the riskiness of the specific borrower on average as it expresses his predisposition to engage in risky activities without any consideration pertaining to an asymmetry of whatever sort.

Because in the face of increase in borrowing rate, they rationalise their financial situation in such a way that they expect loans not to perform more and more for incremental increases in loan rates.

Disrespectfully of the destination of credit, the measurement of borrowers' credit worthiness we adopt is essentially aimed at assessing this aspect from the standpoint of the banking sector and not computed for a single bank customer. The aim of aggregating this feature to the banking system level is obviously to ascertain it provides a benchmark for qualifying a major threat to financial stability for the credit sector.

Although the method adopted in the literature is taken from a microeconomic perspective, it still stands filled with biased information asymmetries that implicit in the computation of scores which are namely free riding and adverse selection.

It is needless to state here that with this couple of information asymmetries there is one additional problem that arises which is quite controversial. Indeed, in order to reduce adverse selection banks recourse to scoring institutions which exacerbate the free riding information asymmetry by analysing the feasibility of the project to finance by credit through neglecting its specificities and taking the credit worthiness of the project owner as a benchmark based on past performance of its repayment trustworthiness independently of the expected outcome of this specific project which is ndoubtfully eroonated.

As a matter of fact the borrower that is badly scored can still succeed in this specific project and have a loan performing well whereas the borrower that is well scored can still have a project that is mostly expected to fail and lead the borrower not to repay the loan.

These compromising inconsistencies are better shown by the unrealistic character of the scenario taking into account information asymmetries when compared to he scenario based on investor risk appetite that performs well enough and gives a realistic outcome in all aspects.

According to Mishkin FS (1998): « The free rider problem is an information asymmetry that occurs because institutions do not spend resources on collecting information but take advantage of a free ride from the information that other institutions have collected ».

Besides leading to a bad screening this information asymmetry increases covariance between NPLs as the screening of the root borrowers are correlated and results in a cyclical shape of NPLs that results from its total dependency on the phase cycle of business fluctuations.

Elbir DM (2021) in her article about the relationship between non performing loans banking system stability and economic activity in Tunisia stated that.

«Banks with lower Non performing loans tend to have higher profitability».

Therefore basically colletaralizing is not expected to be a significant determinant neither of banking performance nor of credit worthiness, as it might lose the accounting value it has been attributed in case of non performance if not non performing loans would not have affected banking performance as in case of non repayment of installments the bank can simply refund itself by selling the guarantee.

Therefore, it is obvious that the shape of NPLs would tend to be cyclical with sequential upswings and downturns like in the following global statistics about the shape of NPLs globally.

Mishkin (1998) stated that: «The root cause of financial instability is the breakdown of information flows which hinder the efficient functioning of financial markets».

In his classification of information asymmetries Mishkin (1998) enumerated them as:

«Adverse selection is an asymmetric information problem that occurs before the transaction or credit allocation occurs. When potential bad credit risks are the ones who most actively seek out a loan, the parties are most likely to produce an undesirable adverse outcome meaning a NPL and are most likely to be selected.

Moral hazard occurs because a borrower has incentives to invest in projects with high risk as risk is highly positively correlated with returns.

Free riding occurs when banks find it costly to rely on their own assessment of projects and merely refer to scoring entreprises to score credit worthiness»

The conflict of interest between the borrower and the lender stemming from adverse selection or what we call the agency problem implies that many lenders would decide they would rather not supply credit.

In this case lending and investment are at suboptimal levels and economic performance is hampered.

It is needless to prove that Borrowers' credit worthiness assessed from the lending bank perspective affects considerably financial stability.

It is more confirmed by empirical results concerning the effects of output gap or business fluctuations credit risk and NPLs.

The literature posits that information asymmetries affect considerably financial stability.

Information asymmetries are the main driver of NPLs and the hindrance of affording credit to unworthy borrowers.

Therefore credit worthiness of borrowers from the lending bank perspective affect financial stability.

The more borrower's are creditworthy the less they deteriorate financial stability by attenuating credit risk and therefore financial system instability.

Credit risk is usually defined as the impact of the borrowers' credit worthiness on the risk return tradeoff of loans.

This elasticity might be compromising to compute and model.

Mainly because firstly both items are not easily grasped into a specified figure and require estimation themselves.

The main hindrance concerns the figures themselves that require modeling.

The willingness of the banking sector to bear excessive risk grasped from the credit channel of transmission of monetaty policy is seemingly more adequate to gauge our subject matter and can prevail as a good proxy for credit risk disrespectfully of the channel of transmission taken into account.

NC is easily computable and differentiation of MMR as well.

For simplification and more pronounced accuracy we will adopt this figure expressing the willingness of the banking sector to bear excessive risk and take it for a proxy for credit risk.

The only drawback of this expression is that as long as it takes the credit risk exogenously from the assessment of the bank perspective it bears in itself the hindrance of misspecifying credit risk and subjecting it to information asymmetries like adverse selection and free riding as risk notation is very subjective and in this case at the discretion of the bank that has got many constraints like constraints of cost of collecting data on borrowers.

As a matter of fact in order to save on costs banks usually refer to published data in the central bank

comprising historical information and classifications and past performance of borrowers. By doing so it falls in the hindrance of free riding. This means that it takes a free ride to collect data classifying such or such borrower. This is an information asymmetry that generates a bias of assessment of the very riskiness of the project to finance either by overestimating it or underestimating it. But anyway the bank is not willing to lose the necessary money to undertake the adequate borrower screening.

This approach of assessing credit risk introduces also agency costs or what Mishkin (1998) calls adverse selection whereby the true intention of the borrower and his willingness to refund the loan is unknown. The selection of borrowers is then subject to adverse conditions leading the bank to misspecify an elastic demand of credit to borrowing rates. In this case the bank is interested in the borrower making it earn on increases in borrowing rates but, the problem still stands that these borrowers have the tendency to neglect higher refunding costs with higher borrowing rates because they expect unrealistic profitability from projects and should be further penalised by still higher borrowing rates for a higher risk notation.

The Third Scenario of the Actual Practice Standing for a Realistic Scenario with Both Asymmetries of Information and Investment Sentiment

The scenario with investor risk appetite meaning investor sentiment and riskiness taken into consideration without reference to the item bearing information asymmetries which is credit riskiness as assessed through the quantity of credit supplied sensitivity to MMR is more realistic although counterfactual.

This shows the extent to which information asymmetries imbedded in credit supplied to borrowers introduce a bias of estimation of borrowers credit worthiness.

But still the problem is that in reality both items are taken into consideration or in other words items bearing information asymmetries such as credit risk and scoring and items with a purview on investor behavior which makes the second scenario although outperforming the first one which shows negative and biased effects of information asymmetries and positive effect of taking into consideration true riskiness of investors is still not used in practice and not realistic enough.

This makes the third scenario taking into account both counterfactual scenarios more realistic among all.

Indeed it leads to the most realistic empirical results with a reversal in the sign of coefficients of investor risk appetite and credit risk.

This is mainly due to supply side and demand side aspects of riskiness whereby in the first scenario credit risk is a threat for borrowers credit worthiness whereas in the third case once riskiness is taken into account from the banking risk appetite side and the investor risk appetite side it is obvious that banking risk appetite with asymmetric information improves borrowers credit worthiness or entitlment to be credit worthy relatively to the case where banks are risk averse whereas with investors having more risk appetite the effect on credit worthiness is negative in propagation as no longer aspects of seriousness and soundness of project management are taken into consideration merely more risk appetite means more threat of default thus fewer credit worthiness.

Whereas at the initial shock the effect of investor risk appetite mainly informs on the health of the project management because as long as investors are driven by risk appetite they strive for profitability and therefore are sound in managing their projects and more likely to make it flourish and be profitable and therefore let their loans perform as the project is more likely to succeed.

Information asymmetries are implicitly taken into account in credit supplied and therefore credit risk which is a measure of past riskiness of credit bears misleading information in comparison to a riskiness assessment based on an exogenous measure of investor risk appetite.

As a matter of fact empirical results corroborate such a statement with more realistic empirical results for the second scenario.

Still credit risk is having a negative effect in the first scenario because it is a measure of overall riskiness of credit and therefore affects negatively borrowers credit worthiness.

But in the third scenario it is an expression of supply side banking riskiness and investor risk appetite is an expression of demand side borrowers riskiness. This is why signs of coefficients reverse across scenarios.

Still other empirical results are the most realistic in the third scenario that takes into account of actual

practice where information asymmetries do play a role although not providing reliable measures.

Prospective Versus Retrospective Insights of Credit Worthiness Assessment and the Contributive Effect of Sensitivity Modeling of Borrowers Credit Worthiness

Scoring is retrospective. It is based on historical data about past performance of borrowers.

Whereas sensitivity based assessment is prospective. Although it is macro economically founded. It is based on future prospects of eligibility to be credit worthy and not past performance in credit worthiness performance.

The past performance geared assessment falls in short of fulfilling ranking agencies commitments to provide accurate assessment of future credit worthiness.

If we take credit risk into account information asymmetries exert a neglecting effect of NPLs effect on the borrowers credit worthiness mainly because credit production elasticity bears a more prominent role than NPLs elasticity to borrowing rates as credit risk us a measure if banking credit supply worthiness than borrowers credit demand worthiness .

But if we take investor risk appetite into account. Investor sentiment and risk appetite affect credit demand and credit production as well as NPLs and their elasticity to cost of borrowing.

Thus the specification of borrowers credit worthiness with investor risk appetite is an assessment if credit demand credit worthiness is a better fit and more realistic than in the case where credit risk is assessed from the banking sector perspective an represents an assessment of banking sector credit supply worthiness or soundness.

The willingness of the banking system to bear excessive risk provides an assessment of credit risk from the supply side. Whereas the investor risk appetite provides an assessment of credit risk from the demand side.

They are the same only in the case of absence of information asymmetries.

Borrowers Credit Worthiness and Stock Market Indicators:

Borrowers credit worthiness is closely related to investor sentiment and risk appetite.

Hence it is related inversely to stock market indicators.

The rationale lying behind is that when stock market indicators are high in principal component of indicators this means that the cost of internal financing of entreprises is low. Therefore the effect is like the financial accelerator with managers eroding from external financing and therefore exacerbating their borrowers credit worthiness because they do not need to convince bankers to lend to them.

When stock market indicators are low the cost of internal financing for entreprises is high. Entrepreneurs or entreprises managers have a preference for external financing and improve their banking borrowers credit worthiness to convince banks to lend to them.

The effect work contrariwise to the financial accelerator effect.

An adequate assessment of credit worthiness should be forwardedly guided because the credit

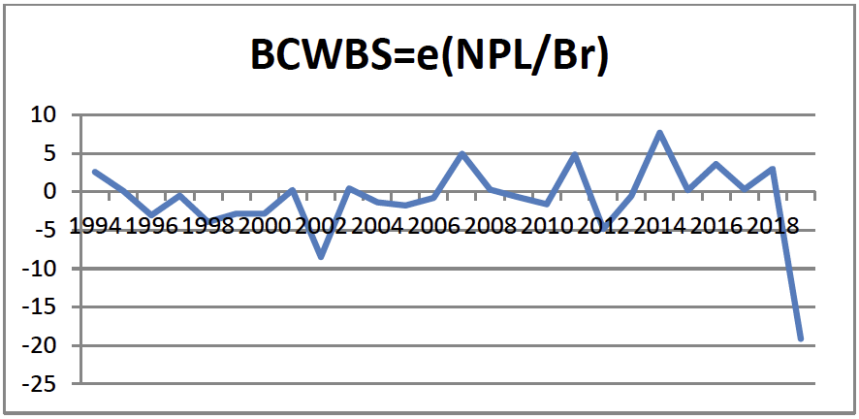

Chart 1: Plotting of the Computed Sensitivity Assessing Borrowers' Credit Worthiness.

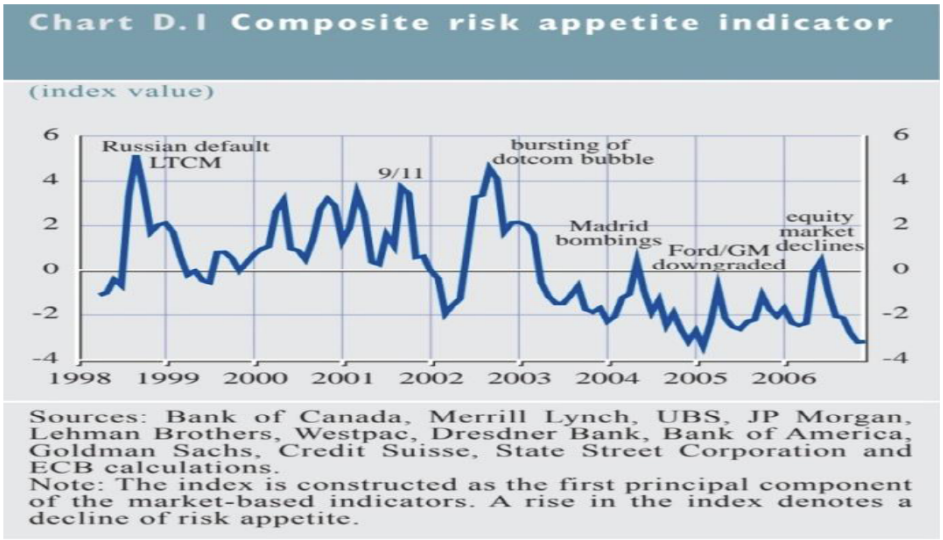

Chart 2: Investor Risk Appetite.

worthiness matters for future aspects of resilience affecting financial stability whereas scoring and credit risk assessment are obviously based on historical data hence geared towards the past.

Henceforth a forwardedly guided figure geared towards forecasting fits best the assessment of borrowers credit worthiness.

3. DESCRIPTIVE STATISTICS

All Data involved in this research paper are collected from Reuters Datastream data bases. They span from 1980 to 2018 in annual frequency.

It is obvious from this *chart* that borrowers credit worthiness is negatively autocorrelated meaning that there are alternations of pikes and troughs suggesting negative dependence between successive lagged values.

The empirical model should verify this essential feature of significant negative autocorrelation to be in compliance with the reality of the shape of borrowers credit worthiness.

The alternations with pikes and troughs grasps both the pattern of business cycle fluctuations discussed earlier and also the pattern of investor risk appetite and investment sentiment that is distinguished also by alternations in pikes and troughs.

As will be shown later, it is verified by empirical findings that business cycle fluctuations and investor risk appetite are key determinants of borrowers credit worthiness and by a way of consequence it is normal that its shape and pattern of evolution grasps particularities of patterns in evolution of both investor risk appetite and business cycle fluctuations mainly distinguished by alternations in pikes and troughs.

There are two main hypothesies justifying the shape of investor risk appetite; one is linked to the correlation with the business cycle phase and one is linked to the arbitrage specificity:

The first hypothesis is that Investor risk appetite is following a pattern of alternations between pikes and troughs meaning that it is either procyclical in phase with the business cycle or countercyclical but anyway not a cyclical.

Therefore there is a strong correlation between business cycle fluctuations and investor risk appetite suggesting a strong relationship between market risk and instability and the business cycle fluctuations.

This is corroborated by the instances of troughs in the *chart* that correspond to depressions and confirm the hyotheisis of strong correlation between troughs of investor risk appetite and depressions thus in phase with business cycle fluctuations and mainly pro-cyclical.

Therefore, the consensus that the main trigger of stock market volatility comes from new comes and research and Development industries and firms subjected to restructuration and bankruptcy is subject to criticism because as long as business cycle fluctuations affect considerably market indicators and their principal component as expressed in investor risk appetite shape, there is skepticism about the role played by those types of firms whose profitability and

share prices variability are a-cyclical and therefore independent of the business cycle fluctuations .

Indeed the main source of financial instability comes from those businesses whose profitability prospects are compromisingly unique in their character and therefore would trigger at tractability of investor risk appetite and bind their pattern to evolve correspondingly to theirs or in other words a-cyclical.

Buy the descriptive statistics showed a pro-cyclical pattern of evolution of investor risk appetite.

The second hypothesis linked to the investment arbitrage decision while buying securities is that; When an investor buys up he expects to resell in a short period of time.

So he buys up when prices are low and out of pocket money would be low.

As he buys up his sentiment is high and risk appetite is high.

When prices are high investors do not expect to sell in a short period of time so interest is an extra burden. Therefore they buy down and bear a discount on interest until prices go down.

If they but down their sentiment is low and the risk appetite is low.

Thus investor risk appetite and investor sentiment are reversed with respect to the principal component of the market indicators that translate stock prices pattern.

This hypothesis is seemingly more likely.

The shape of global tendencies in non performing loans is in phase with the business cycle according to statistics as in the following graph and merely countercyclical to be more specific.

This is in accordance with the theoretical underpinning according to which NPLs increase in recessions and decrease in expansions and assumes obviously that credit production worldwide is destinied to those entreprises whose profitability is in phase with the business cycle which is not really the case.

Indeed, usually the big services providers the megaprojects and high teck industries are acyclical in the sense that their profitability is independent of the phase cycle of the business cycle.

Therefore the countercyclical shape of NPIs worldwide is not due to the response of profitability of borrowers to the cycle phase but merely to the shape of investor risk appetite which happes to be countercyclical for stock market considerations not banking sector considerations.

The countercyclicality of investor risk appetite leads to much investor risk appetite during recessions when

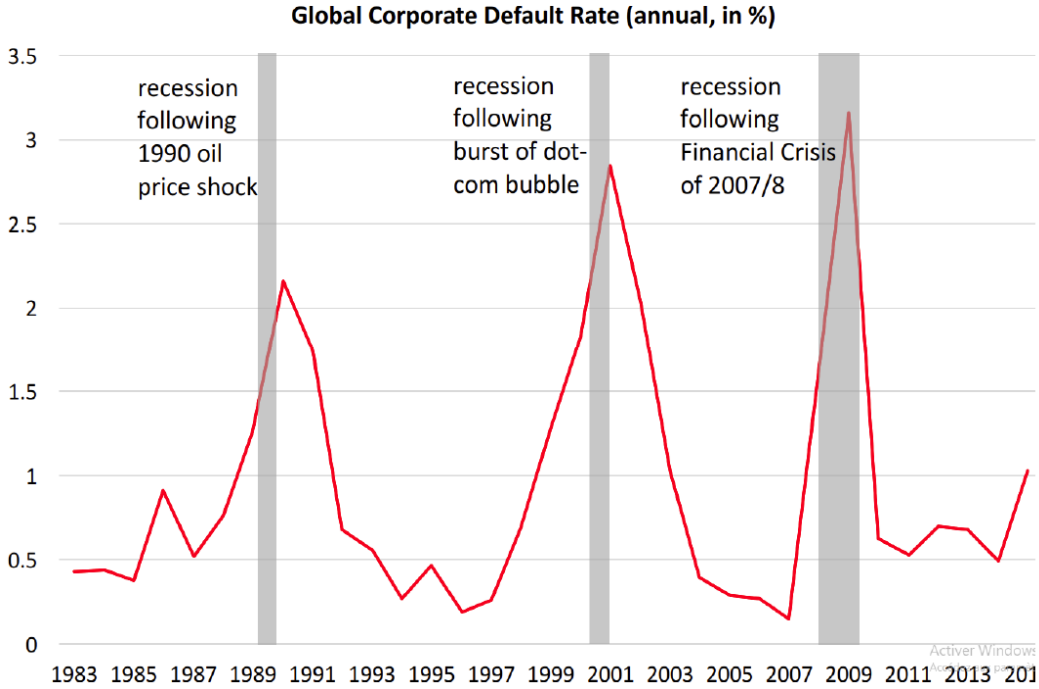

Chart 3: Global Corporate Default Rate.

stock prices are tranquil allowing for speculation based on forecasting on a strong market prospective basis.

4. RESEARCH METHODOLOGY

In our case study we think the scenario of regressing the elasticity in the left hand side although approximated is our basic prerequirement mainly because our subject matter deals essentially with policy making and recommendations with a certain caution to take about poorness of models whenever regressands increase considerably.

Poi (2012) uses the Quadratic ideal demand system of Banks *et al.* (1997) and runs a predicted uncompensated price elasticity of demand model and finds evidence that are nearly similar to Genc (2016).

Indeed, he finds that for averaged elasticities or approximated elasticities the errors are high whereas for estimated elasticities or what he calls true elasticities the errors are lower but raises the debate according to which this is a controversial finding as averaged elasticities are a better fit for economic policy making but with higher error and poorer results.

If still stands that overall if incremental changes in regressands are small averaged values perform well but if incremental changes in regressands are high then estimated values of elasticities perform better with lower error for the model.

But if incremental changes in regressands are too low then approximated values of elasticities outperform estimators in estimation models in terms of validity for economic policyas stated fou in the literature Genc (2016) and Banks and Al. (1997).

Still estimated elasticities is a better approximation of the mathematical function because it is set disrespectfully of the value of the elasticity although not to always adequate for economic policy decision making purposes provided we make use of the best fit of the estimation technique which should fit the theoretical hypotheses of dynamic short and long run equilibriums with lagged and autoregressive items like for relevant theoretical references on financial time series that are autoregressive and with dynamic lags in Perasan and Shin (1998) and Perasan, Shin and Smith (2001).

The adopted specification for ARDL autoregressive dynamic lags modeling:

Endogenous and Exogenous Variables

e(NPL/Br) Sensitivity of non performing loans to borrowing rates expressing borrrowers' credit worthiness

e(NCPS/MMR) sensitivity of new credit to the private sector to money marketrates expressing the willigness of the banking system to bear excessive risk or credit risk

INVRISAPP or investor risk appetite collected from reuters datastream as being the inverse of the principal component of a composite stock market index

OG or output gap

NPL or Non petforming loans

1rst Scenario Specification

denplr(t) = a+ b denplr(t-1) + c dencpsmmr(t) + d dencpsmr(t-1) + e dencpsmmr(t-2) + f dnpl(t) +g denpl(t-1) + h denpl(t-2) +i dog(t) + j dog(t-1) +ε(t).

2nd Scenario Specification

denplr(t)= a + b denplr(t-1) + c dinvrisapp(t) + d dinvrisapp(t-1) + e dnpl(t) + f dnpl(t-1) +g dnpl(t-2) +h dog(t) + i dog(t-1) + j dog(t-2) + k deecdnpl(t) +l deecdnpl(t-1) +m deecdnpl(t-2) +ε(t)

3rd Scenario Specification

denplr(t) = a +b denplr(t-1) +c dencpsmmr(t) + d dencpsmmr(t-1) + e dinvrisapp(t) + f dinvrisapp(t-1) + g dinvrisapp(t-2) +h dog(t) + i dnpl(t) + j dnpl(t-1) + k dnpl(t-2) + ε(t)

5. EMPIRICAL RESULTS

First Scenario Results

Variable	Coefficient	Probability
DENPLLR(-1)	-0.156542	0.2629
DENCPSMMR	-0.341225	0.0476
DENCPSMMR(-1)	-0.414712	0.0453
DENCPSMMR(-2)	-0.617686	0.0290
DNPL	4.14^{E}-06	0.1432
DNPL(-1)	-9.93^{E}-07	0.5024
DNPL(-2)	1.60^{E}-06	0.1986
DOG	4.625359	0.0431
DOG(-1)	2.815594	0.0401
Constant	-0.089996	0.8534

Borrowers' credit worthiness depends on credit risk and OG and is not autocorrelated. NPLs do not affect significantly borrowers' credit worthiness but credit risk does in shock propagation and equilibrium very significantly.

The free riding and adverse selection involved by assessing the credit worthiness through systemic credit risk fathomed at the banking sector level affect borrowers' credit worthiness mainly because of a significant coefficient for all lagged values.

It is needless to state here that credit risk is assessed at the banking sector level.

Hence the overall credit risk exposure affects tremendously borrowers credit worthiness.

Again because of free riding and adverse selection entailed by explaining borrowers credit worthiness by banking sector level credit risk or in other words systemic risk exposure they manage to save the cost of undertaking the adequate screening of the specific borrower.

The goodness of fit of the ARDL model in this case which makes the free riding and adverse selection stand for a method of assessment of borrowers credit worthiness where there is a good fit of the ARDL model is explained by a reliance on cyclicality of borrowers credit worthiness where all coefficients of lagged values of OG are significant making borrowers credit worthiness in compliance with the business cycle phase.

But it is obvious that as long as the empirical finding are insignificant for coefficients for NPLs, the specification with the information asymmetries accounted for by the computation of credit risk through credit production sensitivity which involves screening through scoring leads to inconsistent empirical results with the commonsense expectations of significantly correlated non performing loans with borrowers credit worthiness.

Thus this scenario is undoubtfully counterfactual and inconsistent with the adequately outstanding requirement of taking into account of determinants relative to investment behavior such as risk appetite or eventually both considerations at the same time in other words determinants taking into account scoring accountable for information asymmetries and determinants taking into account investment behavior towards risk that is rather more realistic and would lead to a specification more consistent with real world findings predilections as to the consistency of empirical findings with theoretical predilections.

Second Scenario Results

Variable	Coefficient	Probability
DENPLLR(-1)	-1.054907	0.00145
DINVRISAPP	-6.588527	0.3372
DINVRISAPP(-1)	17.63521	0.0873
DNPL	1.09^{E}-05	0.0032
DNPL(-1)	-1.13^{E}-06	0.4501
DNPL(-2)	-1.22^{e}-05	0.0192
DOG	2.521553	0.0127
DOG(-1)	0.959944	0.1956
DOG(-2)	-3.894106	0.0076
DEECDNPL	0.088983	0.0044
DEECDNPL(-1)	0.587247	0.0036
DEECDNPL(-2)	0.138670	0.0693
C	-0.321017	0.5079

e(ECD/NPL) is the sensitivity of excess credit demand to NPL expressing the response of the banking sector to NPL in terms of credit supply

The second scenario of the equation makes more sense for an adequately shaped screening of borrowers from the banking sector steping aside from the computation of items taking into account scoring that is accountable for information asymmetries like free riding and adverse selection.

Because investment risk appetite is a more accurate measure than credit risk about the borrower's credit worthiness.

Investment risk appetite coefficient is significant

NPL coefficient is also significant.

These two empirical findings are consistent with commonsense expectations about realistic empirical results in compliance with theoretical predilections.

The negative significant autocorrelation of borrowers credit worthiness for the second scenario is in accordance with empirical descriptive finding of

alternations of pikes and troughs in the shape of borrowers credit worthiness.

For the first scenario the coefficient is found to be statistically in significant which is not in compliance with descriptive statistics features of alternating pikes and troughs as if it where really statistically insignificant after slight increases there is no way for slight decreases a.d alternations with increases and decreases in the shape of borrowers credit worthiness fact that means necessarily the existence of a negative significant autocorrelation.

As sensitivity of npl to increases in lr increases there are more npls changes for a given lr increase npls are sensitive to lr increases there fore the bank decides to increase risk premiums to ensure its mitigation of credit risk.

Assuming that npls decreased considerably due to the initial increase in lr it would became more sensitive negatively.

Further increases in lr will attract obviously mainly those investors whose activities are risky at such a point that they are willing to repay debt at any cost. For instance R and D entreprises or very risky electrnics and high teck entreprises.

Therefore NPLs will become less sensitive to lr increases and the sensitivity declines

Those investors whose activities are less dangerous and are willing to react to increases in lr will see their credit demand decline and so do npls therefore in this case further credit demand and NPLs are more sensitive to lr increases.

Therefore NPLs will become more sensitive to lr increases. The elasticity increases.

The final outcome depends on the risk aversion of investors and the nature of their activities.

Empirically the coefficient is negative and not significant meaning that as sensitivity of NPLs to lr increases further sensitivity of npls to lr increases declines.

Therefore investors are mainly becoming less and less sensitive to lr increases by not declining their investment demand.

As credit risk increases banks react by augmenting risk notation with increases in lr logically npls are going to decline because of bad quality investors that become less sensitive to credit risk and risk premiums increases.

Empirically the coefficients are significant and negative which corroborates the theoretical predilection.

But after the initial shock in credit risk due to increases in lr npls are less and less sensitive which means that investment demand still increases disrespectfully of further increases in npls.

For OG increases or widening actual output goes apart from potential output.

Cyclical fluctuations are at their boom. So productions expectations are high.

This might concern the proportion of investors that are good quality investors for whose sales depend on cyclical fluctuations and therefore are sensitive to increases in lr in such a point that when lr increases npls are sensitive to their increase and increase correspondingly.

The empirical findings are in accordance with the theoretical predilection of a positive sign of the coefficient and significant.

It is seemingly more realistic and commonsense that borrowers credit worthiness is better grasped by a comprehensive screening of investor or borrower risk appetite and past observations of non performing loans as in the case of absence of information asymmetries than through credit risk and the business cycle phase like in the case where the assessment of borrowers credit worthiness is subjected to information asymmetries like free riding to contain extra credit screening expenses and agency costs or adverse selection like in the case of a bad notation of risk pertaining to the specific project.

Therefore although both scenarios lead to models estimating borrowers credit worthiness with a good fit and robust the second one without information asymmetries is more realistic as most investors like mega services providers airlines telecommunications service providers high teck projects are in most cases acyclical with a segment of high income customers making their expected profitability independent of

whether there is an expansion or a recession in the business cycle.

In the first scenario credit risk is very significant whereas npls are not significant implying that information asymmetries biased the assessment of borrowers worthiness with an inconsistant result of insignificant coefficient of Npls basically very important for borrowers' credit worthiness assessment.

In the second scenario information asymmetries are not introduced with omitted credit risk as regressor.

In this case, not only does investors risk appetite is significant although data for investment risk appetite are not as accurate as global data computed on the basis of the principal component of market indicators in the first lag but npls are very significant in values and impact on rejection as taken in value form value form of NPL and sensitivity form e(ECD/NPL) meaning the impact of NPL on rejection of credit demand.

This second scenario shows the importance of not introducing information asymmetries which confers a realistic assessment for fathoming of borrowers credit worthiness.

The cyclicality with the business cycle phase is noticeable in both scenarios because the shape of borrowers' credit worthiness is cyclical with recurrent pikes and troughs and also because investor risk appetite and Npls are cyclical or in phase with the business cyclical but mostly countercyclical.

This is revealed by a significant coefficient of OG in both scenarios.

Therefore the second scenario without information asymmetries is more accurate for the assessment of borrowers credit worthiness and far outperforms the first one in that it does not banalise criteria of assessment of borrowers credit worthiness that result from information asymmetries such as free riding and adverse selection or agency costs.

Third Scenario Empirical Findings

It still stands that both above mentioned scenarios are counterfactual; the one with business cycle effects and free riding and adverse selection as information asymmetries as well as the second one with business cycle effects and a better performing screening without free riding and adverse selection where investment risk appetite is a more accurate measure than credit risk about the borrower's credit worthiness.

This is mainly due to the fact that in the real world banks actually do take into considerations both aspects of riskiness the one entailing scoring as well as the one accounting for investment behavior.

Third Scenario

Variable	Coefficient	Probability
DENPLLR(-1)	-0.539376	0.0130
DENCPSMMR	-0.063528	0.1838
DENCPSMMR(-1)	0.049531	0.0453
DINVRISAPP	2.345024	0.8439
DINVRISAPP(-1)	-41.12926	0.0140
DINVRISAPP(-2)	21.40634	0.0437
DOG	-3.120531	0.0732
DNPL	6.74^{E}-08	0.9557
DNPL(-1)	-9.26^{E}-06	0.0075
DNPL(-2)	9.86^{E}-06	0.0032
C	0.296795	0.7085

The third scenario empirical results reveal to be the most consistent with the real world commonsense predilections.

As a matter of fact, the lag of ENPLLR which is the lag of borrowers credit worthiness has got a negative and statistically significant coefficient and is therefore in compliance with the theoretical and descriptive statistics predilections of a negative autocorrelation.

Besides, credit risk fathomed from the supply side or the willingness of the banking system to bear excessive risk coefficient is statistically insignificant at the level and positively correlated and statistically significant at the first lag which means that credit risk from the supply side at the first lag affects positively borrowers creditworthiness which is consistent with the theoretical predilections of a positive correlation as when credit risk assessed this way from the supply side that is the willingness of the banking system to bear excessive risk increases it is by a way of consequence more tolerating vis-à-vis borrowers credit worthiness as

much it is willing to bear more risk and reveals more tolerating in terms of borrowers worthiness even if they incur risk by allocating more credit.

Investment risk appetite effect is measured at the first shock as having a positive effect and statistically significant and at the propagation as having a negative effect which is also significant.

The interpretation is that at the initial shock the increase in investment risk appetite translates into a sign that the investors are striving for improving their profitability through increased appetite for risk as risk and return go in parallel. As long as they strive for mre profitability their management policy is more sound they appraise better their projects and therefore they are more likely to make their projects succeed and find liquidity to repay their loan. They are by a way of consequence claimed to be credit worthy by the banking system.

In the propagation, increased investor risk appetite means extra risk exposure that is negatively signalling for the banking sector of an extremely inprudent exposure to risk more likely to be signalling an indifference towards wise expectations of projects profitability and meaning as well investors are indifferent as to whether their loans would be refunded afterwards. Therefore the effect on borrowers credit worthiness.

Ath the equilibrium the coefficient is insignificant as there are two driving forces one appraising positively an increase in investor risk appetite as to the interpretation of the strive for profitability of investors and one appraising negatively an increase in investor risk appetite as to the interpretation of implications of effects of inprudence on the likelihood of repayment of loans.

Therefore it is obvious that scoring which affects the amount of credit to be supplied and supply side credit risk as being the willingness of the banking system to undertake excessive risk is misleading for the appraisal of borrowers credit worthiness. Its empirical implications hold most of misspecification inducing information asymmetries leads to blind unconclusive implications as to the precise effect of risk entailed on the borrowers credit worthiness.

It is therefore obvious that information asymmetries imbedded in the computation of ENCPSMMR is spurious and misleading and introduces a bias that might be compromisinh if taken into account on its own.

But the commonsense scenario that corresponds to the real world has to take into account that the banking sector makes use of scoring to allocate credit and thereby includes information asuymmetries in the assessment of borrowers credit worthiness.

The empirical results on the coefficients respective to non-performing loans are in compliance with theoretical predilections. For the first lag but not for the second lag. The reason lying behind a positive effect of the initial shock is that as investors fail to perform they immediately adjust their prioritising of repaying their loan in order to able to benefit from borrowing ulteriorly. But as they continue up non performing the effect turns out negative.

For the output gap which shows the phase of correlation with business cycle the effect of OG is negative with a statistically significant coefficient which means that the borrowers credit worthiness is counercyclical. This is indeed corroborated by the theoretical and descriptive statistics predilections as depicted from the *chart* on global shape of investor risk appetite with most noticeable global conjectures of recessions and its definition together with the *chart* on global shape of Non-performing loans and its correspondence with global conjectures related to recessions.

The conclusions have been drawn in the bove analysis in the article.

6. MONOPOLISTIC COMPETITION AND INFORMATION ASYMMETRIES

Asymmetric information is a barrier to entry in the lending market that disables banks to accurately proceed to borrowing due to the conundrum of credit worthiness accurate assessment heralding the hindrance of NPLs and the must of matching risk premiums to the criteria of risk exposure that involve competitiveness.

D'ell Arricia (1998) stated that « The informational asymmetries are an important determinant of the lending sector structure and represent a barrier to entry for new banks closely related to uncertainty about borrowers' credit worthiness ».

D'ell Arricia (1998) emphasized that: « these informational asymmetries cause adverse selection and moral hazard problems and may invalidate standard competitive market results. However, over

time lenders resolve part of these informational problems (Scenario 2). In the process of lending, financial intermediaries are able to gather some proprietary information about borrowers' credit worthiness Hence they acquire some degree of informational monopoly about their clients and thus market power (scenario 3).»

The realistic scenario or the third scenario makes the real opportunity cost between price taking and price making according to credit market prerequisites and investor sentiment tolerance and risk premiums price setting dynamics in a monopolistic competition market like the credit market prevail.

Information asymmetries are binding for the demand supply equilibrium and help fathom the extent of market imperfections involved.

Whereas, for the first two scenarios there is case of incomplete markets one covering exclusively the issue of information asymmetries and one covering exclusively investor sentiment.

Although they translate inadequacy of incomplete market for an accurate fathoming of borrowers credit worthiness they still stand as an additional proof of the bias introduced by information asymmetries with absurd empirical results for the first scenario.

The market structure of the banking sector in the case of both demand and supply triggers for price setting of risk notation in the case of prevailing information asymmetries and Investor sentiment or risk appetite is monopolistic competition.

This is revealed by the mechanism whereby the price setting for risk premiums and eventually borrowers credit worthiness is set whenever information asymmetries implicit in credit risk set through scoring acts like a cost supply push and Investor risk appetite acts like a demand pull for the price.

Depending on the bargaining or negotiation power of both actors banks and investors or borrowers the price is set correspondingly within the framework of a monopolistic competition market structure.

7. CONCLUSION

The analysis of three scenarios made it possible to draw relevant conclusions on the issue of the effect of information asymmetries on the analysis of the solvency of borrowers from the perspective of the Tunisian banking sector.

The first two scenarios, which are counterfactual, attempt to elucidate the measurement and modeling biases introduced by the analysis restricted to the real aspect as recorded in investors' risk appetite and the asymmetrical aspect as recorded in the measurement of credit risk largely presenting a dependence on scoring or rating carrying information asymmetries such as free riding or layout cost or even adverse selection.

These scenarios were eliminated as being scenarios not prevailing as suitable due to the inadequacy of the empirical results which made prevail the third most realistic scenario and corresponding to the real conduct of the measurement of the solvency of the borrowers as the scenario most judicious as all empirical results are justifiable by theoretical predilections.

In this scenario, credit risk corresponds to the risk on the credit supply side and the risk appetite of investors corresponds to the risk on the credit demand side. The solvency of borrowers is counter-cyclical with the business cycle contrary to the first two scenarios, which is justified by the fact that the banking system penalizes borrowers in terms of solvency when the cycle is in an expansion phase and improves borrowers in terms of of solvency when the cycle is in a recessionary phase. This translates the behavior of supply and demand for markets which are not imperfect up to a certain limit.

Neither the banking system nor the borrowers have any necessary bargaining power. So that when there is expansion investors have more bargaining power or audacity so the banking system reacts by adjusting the upward trend of insolvency or imprudence and penalizes investors by increasing scoring which becomes stricter to take into account the reckless optimism of investors. Whereas when there is a recession investors have less bargaining power or audacity so the banking system reacts by adjusting the downward trend of insolvency or the decline recklessness and improves investors by relieving scoring, which becomes less strict and improves the measure of solvency.

So the bargaining power of supply and demand are balanced. However, for information asymmetries and the exclusive consideration of risk appetite, the banking sector alone has bargaining power and therefore

REGRESSION RESULTS WITH SHORT RUN ARDLS

First Scenario

Dependent Variable: DENPLLR
Method: ARDL
Date: 11/11/22 Time: 06:34
Sample (adjusted): 2007 2018
Included observations: 12 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (2 lags, automatic): DENCPSMMR DNPL DOG
Fixed regressors: C
Number of models evalulated: 27
Selected Model: ARDL(1, 2, 2, 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
DENPLLR(-1)	-0.156542	0.101482	-1.542553	0.2629
DENCPSMMR	-0.341225	0.077240	-4.417713	0.0476
DENCPSMMR(-1)	-0.414712	0.091449	-4.534923	0.0453
DENCPSMMR(-2)	-0.617686	0.107602	-5.740451	0.0290
DNPL	4.14E-06	1.76E-06	2.350225	0.1432
DNPL(-1)	-9.93E-07	1.22E-06	-0.811209	0.5024
DNPL(-2)	2.60E-06	1.37E-06	1.894658	0.1986
DOG	4.625359	0.993075	4.657611	0.0431
DOG(-1)	2.815594	0.581675	4.840493	0.0401
C	-0.089996	0.429313	-0.209627	0.8534

R-squared	0.988614	Mean dependent var	0.314996
Adjusted R-squared	0.937375	S.D. dependent var	5.737892
S.E. of regression	1.435911	Akaike info criterion	3.436383
Sum squared resid	4.123681	Schwarz criterion	3.840472
Log likelihood	-10.61830	Hannan-Quinn criter.	3.286775
F-statistic	19.29418	Durbin-Watson stat	1.222070
Prob(F-statistic)	0.050228		

*Note: p-values and any subsequent tests do not account for model selection.

Second Scenario

Dependent Variable: D(ENPLLR)
Method: ARDL
Date: 12/20/22 Time: 03:41
Sample (adjusted): 1998 2018
Included observations: 18 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (2 lags, automatic): D(INVRISAPP) D(NPL) D(OG) D(EECDNPL)
Fixed regressors: C
Number of models evalulated: 81
Selected Model: ARDL(1, 1, 2, 2, 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
D(ENPLLR(-1))	-1.054907	0.215268	-4.900444	0.0045
D(INVRISAPP)	-6.588527	6.208669	-1.061182	0.3372
D(INVRISAPP(-1))	17.63521	8.310070	2.122149	0.0873
D(NPL)	1.09E-05	2.06E-06	5.293539	0.0032
D(NPL(-1))	-1.13E-06	1.38E-06	-0.818860	0.4501
D(NPL(-2))	-1.22E-05	3.59E-06	-3.400173	0.0192
D(OG)	2.521553	0.664523	3.794531	0.0127
D(OG(-1))	0.959944	0.642807	1.493364	0.1956
D(OG(-2))	-3.894106	0.902072	-4.316848	0.0076
D(EECDNPL)	0.088983	0.018082	4.921153	0.0044
D(EECDNPL(-1))	0.587247	0.113563	5.171125	0.0036
D(EECDNPL(-2))	0.138670	0.060164	2.304875	0.0693
C	-0.321017	0.450425	-0.712698	0.5079

R-squared	0.982657	Mean dependent var	-0.177133
Adjusted R-squared	0.941033	S.D. dependent var	4.083992
S.E. of regression	0.991724	Akaike info criterion	2.984767
Sum squared resid	4.917584	Schwarz criterion	3.627813
Log likelihood	-13.86290	Hannan-Quinn criter.	3.073435
F-statistic	23.60791	Durbin-Watson stat	2.285285
Prob(F-statistic)	0.001310		

*Note: p-values and any subsequent tests do not account for model selection.

Third scenario

Dependent Variable: D(ENPLLR)
Method: ARDL
Date: 12/20/22 Time: 03:37
Sample (adjusted): 2003 2018
Included observations: 16 after adjustments
Maximum dependent lags: 1 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (2 lags, automatic): D(ENCPSMMR) D(INVRISAPP) D(OG) D(NPL)
Fixed regressors: C
Number of models evalulated: 81
Selected Model: ARDL(1, 1, 2, 0, 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
D(ENPLLR(-1))	-0.539376	0.142945	-3.773308	0.0130
D(ENCPSMMR)	-0.063528	0.041208	-1.541647	0.1838
D(ENCPSMMR(-1))	0.049531	0.018671	2.652811	0.0453
D(INVRISAPP)	2.345024	11.30816	0.207374	0.8439
D(INVRISAPP(-1))	-41.12926	11.12588	-3.696719	0.0140
D(INVRISAPP(-2))	21.40634	7.978714	2.682931	0.0437
D(OG)	-3.120531	1.379775	-2.261624	0.0732
D(NPL)	6.74E-08	1.15E-06	0.058416	0.9557
D(NPL(-1))	-9.26E-06	2.14E-06	-4.324658	0.0075
D(NPL(-2))	9.86E-06	1.86E-06	5.294143	0.0032
C	0.296795	0.749630	0.395922	0.7085

R-squared	0.960286	Mean dependent var	-0.344409
Adjusted R-squared	0.880858	S.D. dependent var	4.237756
S.E. of regression	1.462745	Akaike info criterion	3.810356
Sum squared resid	10.69812	Schwarz criterion	4.341511
Log likelihood	-19.48285	Hannan-Quinn criter.	3.837556
F-statistic	12.09000	Durbin-Watson stat	1.792865
Prob(F-statistic)	0.006575		

*Note: p-values and any subsequent tests do not account for model selection.

improves solvency in expansion and penalizes in recession and for risk appetite. This is due to the excessive prevalence of market imperfections. However, for imperfect markets, prices are made by certain operators rather than by the interaction between supply and demand. For the counterfactual cases the excessive imperfection due to the asymmetries of information in the first case and the abstract character of the evaluation of the solvency in the second case which is exclusively determined by the risk appetite of the investors the risk premiums are not determined by the interaction between supply and demand. Or when risk premia are determined by supply and demand. In expansion, the demand for credits is in excess, so prices increase, which penalizes the evaluation of the solvency of borrowers. And for the recession the demand for credits is in deficit therefore the real risk premiums decrease which improves the evaluation of the solvency of the borrowers which is moreover counter-cyclical in the two cases of figure. However, for counterfactual cases, the price makers are the banks. So when there is an expansion the quest for profitability is satisfied by the excess profit margin of the projects so the banks lower the risk rating so that the banks subsidize the borrowers and the solvency of the borrowers is procyclical with the cycle of 'business. Whereas when there is a recession, the reduced profitability of projects does not satisfy the banks' quest for profitability, which penalizes borrowers in terms of risk rating. This worsens the risk rating such that banks penalize borrowers and borrower creditworthiness is procyclical with the business cycle. Whereas for the real case which takes the aspect of supply and demand as being in quasi-equilibrium there are the least market imperfections and therefore a pricing logic which governs the interaction between supply and demand and leads to countercyclicality between the business cycle and the creditworthiness of borrowers.

All these results have revealed for the third scenario to be in compliance with theoretical predilections and validate the motivation of the research according to which including into modeling items comprising asymmetric information that are of prominent relevance for the subject matter is essential for empirical modeling to be compliant with economic theoretical predilections although they introduce a bias of assessment into the modeling.

The rationale lying behind is that both counterfactual alternatives do not fit a realistic overview of what really occurs. In other words, empirical findings for them are not compliant with theoretical predilections for the case of ARDL short run dynamics.

Hence, compliance of empirical findings with theoretical predilections is not relying on absence of information asymmetries whose full consideration does not introduce spuriosity into empirical results. Contrariwise, skipping determinants comprising information asymmetries introduces spuriosity that weakens the goodness of fit and makes empirical finding not compliant with theoretical predilections.

The added value of research is that, when we want to estimate any entity, the explanatory variables carrying market imperfections must be manifested and not implicitly invocated because of the endogeneity of market imperfections; otherwise, the estimation is inadequate and the empirical results do not correspond to the theoretical predilections.

That said, Economic theory anticipates the effect of market imperfections such as information asymmetries, for example, in its predilections for dynamic interrelationships between economic entities or aggregates.

And the variable information asymmetries should not be indexed as an explanatory variable, since it is endogenous to the model.

This method is deemed to provide the merits to highlight accurately the role played by a key notion through multiple scenarios analysis.

It could be applied to any item related to information asymmetries as it is obvious that information asymmetries cannot be grasped by a variable therefore its impact should be grasped through deduction and induction through logical analysis affordable with this kind of three scenarios analyses.

But it is subjected to criticism as it is grasped logically and inductively and has no precise relevance that shows the synequanone condition provided by définitions for credit risk and borrowers' Creditworthiness.

The analysis provides a new method or theoretical approach similar to the factual counterfactual approach but with three scenarios the first one encompassing solely the key notion the second one steping aside it and the third one which is claimed to be realistic is

synthetic or comprehensive covers all features related to a certain notion in our case information asymmetries.

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