

FINANCIAL AND SOCIAL PERFORMANCE OF SENEGALESE MFIS: A COMPARATIVE ANALYSIS OF THE EFFECTS OF A DEFAULT RATE INCREASE

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Abstract

The article focuses on the quality of the loan portfolio of microfinance institutions (MFIs) in Senegal. The study was designed to assess the effect of the increase in non-performing loans (NPLs) on financial and social performance of MFIs and to specify appropriate repayment policies in deteriorating loan portfolios. Data for the period (1980-2010) were collected from Senegalese MFIs and analyzed using VAR models and impulse functions. The results show a significant level of influence of financial variables as opposed to social variables, indicating that the financial dimension remains decisive in political management credit risk of MFIs in Senegal.

Key words: Microcredit, Unpaid, risk, financial and social performance.

JEL: C51, G32, P27

1. INTRODUCTION

Microfinance institutions (MFIs) are specialized in the collection of savings and the provision of microcredit services, insurance and transfer to a specifically poor target population. The lack of sufficient guarantee covering credit risk, the lack of finance experience among the customers, etc., are parameters that increase management costs. Being unable to control these costs results in a higher interest rate, and at the same time increases the risk of non-repayment (Conning 1999). This study is part of general observations on the quality of the portfolio at risk of MFIs, which continues to deteriorate in the West African Monetary and Economic Union (WAMEU). The situation

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has aroused concern about the sustainability of the microfinance sector in developing countries. Indeed, microfinance is seen as a way of combating poverty through local funding for income-generating activities. MFIs aim to achieve both financial objectives increased repayment rate, lower interest rates and higher volume of microcredit's and social objectives, improvement of living standards and funding income-generating activities. This duality in terms of objectives raises a trade-off issue between improving living conditions of the poor, on the one hand and the profitability of the MFIs on the other hand.

Regarding profitability, Morduch (1999) describes this schism insofar MFIs must achieve both financial and social performance, where the coexistence of two approaches: the institutionalism and welfariste. The first assumes that MFIs should be financially profitable, which ensures their financial viability and sustainability of microfinance activities (Woller and al 1999). The second advocates the improvement of living conditions of poor households by emphasizing guarantees fund and subsidies to offset the risk of default (Asselin and Anyck 2000). In practice, however, these two approaches remain complementary: sustainability of microcredit activities over the long term make it necessary for MFIs to set long term objectives for both financial and social performance. Sustainability of MFIs over the long term can be affected by the deterioration of MFI's asset quality. The latter is measured, according to the regulation of MFIs in the WAMEU, by the default rate of the loan portfolio, the ratio of non-performing loans (NPLs) to outstanding loans. An increase in default rate jeopardizes the capacity of MFIs to attain social objectives and financial objectives. In turn, it leads on to the question: how does a deterioration of the loan portfolio affect financial and social performance variables?

To answer this question, we have conducted a study of the quality of the loan portfolio of MFIs in Senegal in the period 1980-2010. Our study seeks to achieve two objectives: first, to assess the impact of deterioration in the quality of the loan portfolio on financial and social performances; and second, to specify the most appropriate repayment policies to implement if a MFI faces a deterioration of the loan portfolio. The test consists of an empirical analysis based on VAR model and impulse functions.

The paper is structured as follows. Section 1, presents an analysis of the theoretical concepts pertaining to the determinants of financial and social performance. Section 2, discusses the research methodology and empirical modeling. Section 3, presents the modeling, the obtained results, the verification of hypotheses and the conclusion.

2. SOCIAL PERFORMANCE *VERSUS* FINANCIAL PERFORMANCE

Through these two approaches, there are two fundamental and transversal requirements in the functioning of microcredit systems: the principle of social solidarity, embodying a required social performance dimension, and the principle of financial profitability, with a desired financial performance dimension. In the view of Navajas et al. (2000), social performance indicates an appreciation of the socio-economic impact of microcredit from the standpoint of clients. Indeed, the effectiveness of microcredit programs is evaluated in terms of strategies against poverty through indicators such as rising living standards and geographical coverage levels increased household income, the targeting of poor people, adaptation of products, etc. Financial performance, on the other hand, is a measure of the profitability and/or financial viability from the standpoint of the creditor institution. According to Copestake et al. (2001), the evaluation of the financial performance of *MFIs* requires quantitative indicators expressed as standardized ratios along the lines of the norms and procedures in force. Financial viability reflects the self-sufficiency of *MFIs* resulting from an increase in repayment rates, reduction of operating costs, lower default rates, etc.

In Senegal, *MFIs* reach more than 30% of the active population and contribute to the fight against poverty through direct job creation. The private sector continues to expand with 895,000 members in 2007 and nearly 1.3 million in 2010, which is an increase of 44%. According to the report of the National Coordinating Committee of microfinance activities (*CNC*, 2013), the micro-finance sector has experienced three phases: emergence (since 1980), growth and expansion (1993-2003) and a consolidation (since 2004). The financial and social performance depend, to a large extent, on state initiatives such: strengthening the stability of the sector through better customer protection, compliance *MFIs* with international standards in the financial field, and modernization of management tools.

2.1. Determinants of the financial performance of *MFIs*

MFIs have introduced default risk management policies in order to improve the quality of their loan portfolio. These policies include the adjustment of the lending interest rate to the default risk of borrowers, the improvement of quality of the long-term relationship with clients, and the recourse to guarantee funds that can absorb losses resulting from a default. Indeed, the lack of experience in financing and in guaranteeing the risks can result in additional transaction costs for *MFIs*. These costs are likely to lead

to increased interest rates, which may at the same time increase the risk of non-repayment. Transaction costs are *ex-ante* costs insofar as they take into account the costs of fundraising, client assessment, training and project evaluation. They also include *ex-post* costs consisting of administrative and monitoring costs, fund amortization, and provision for losses. In order to generate a margin from operating activities, *MFI*s are required to cover all operational expenses by operating income, which implies higher interest rates (Acclassato 2006).

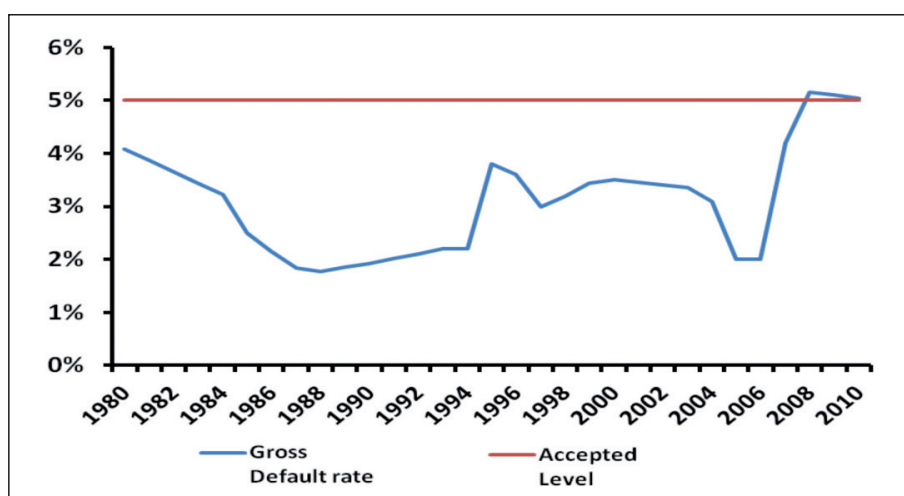
Labie (1996) and Lanha (2002) have shown that the use of high lending interest rate in the microfinance sector do not constitute a barrier to access to microcredit for poor households excluded from the banking sector. Indeed, the provision of guarantees prior to obtaining a loan is lower than that of commercial banks. This situation leads to systematic monitoring of the quality of the loan portfolio at level of the *MFI*.

In the banking industry, the long-term relationship helps to minimize asymmetry of information, which is defined as a situation of uncertainty characterized by imperfect and asymmetric information between different market actors (Stiglitz and Weiss 1981). These relationships, while having a financial and/or social dimension, are defined as the repetition over time of microcredit lending, transfer and insurance activities. From a financial standpoint, these long-term relationships improve the efficiency of financial intermediation by generating a better sharing of credit risk (Haubrich, 1989), since the creditor has information that will help it improve criteria for evaluating the client's creditworthiness. This translates into information cost economies. Observation of movements in deposit accounts provides information about the client's degree of risk aversion and consequently about the likely choice of investments to take on as a borrower (Mayoux 1999; De Briey 2005; Vale 1993). In microfinance, the authors observe the same financial logic for predicting default risk through the nature of deposit accounts that can initially be created from compulsory savings or voluntary savings (Lanha 2002). In *MFI*s savings constitute a security deposit that precedes a loan request. A savings account acts as a warranty even if its value does not usually cover the potential risk of the loan granted. Monitoring financial transactions carried out in these deposit accounts allows the *MFI* to better define the degree of risk of default incurred by the client.

Management of default risk also involves the recourse to various types of guarantees, and in particular to guarantee funds, which allow diversification of credit risk and improvement of repayment rate on loans. A guarantee is a financial instrument that provides protection to a creditor in the event of default of payment by the borrower. From this standpoint, a guarantee fund for

MFIs can be defined as a financial instrument designed to protect a credit institution by another financial institution (such as a bank) in the event of non-repayment of a loan granted to a client (Lanha 2002). *MFIs* credit lines from banks can receive further credit enhancement from development agencies (*NGOs* and the government), which will help further reduce credit risk and, hence, cut borrowing costs. In recent years, the quality of the portfolio at risk of *MFIs* in Senegal continues to deteriorate with default rate exceeding 5% from 2008, as shown in graph 1.

Graph 1: Gross default rate of MFIs in Senegal, 1980-2010



Before the regulation of *MFI* sector (1980-1995), the default rate in the sector was too high; this resulted in low repayment rates identified. After the regulation of the sector in 1995, the default rate has dropped significantly with an improvement in the quality of the portfolio at risk. For cons, the financial crisis periods 2007 and 2008 led to a rise in defaulted loans. The gross rate of deterioration of the portfolio, up from 2007, 5.17% in 2010, exceeding the accepted standard. This situation is explained by higher interest rates resulting from higher overall rates on the financial markets. Thus, microcredit becomes more expensive and households can not honor the terms of their loans. However, apart from the financial dimension variables, *MFIs* use social dimension variables to improve social performance.

2.2. Determinants of social performance of MFIs

Public policies to reduce poverty are described as a set of economic and social objectives to be attained through microfinancing. These policies are supported by microfinance institutions whose main objective is the reduction of poverty through microcredit, savings and micro-insurance. 2005, designated by the United Nations as the year of microfinance, helped extend the reach of microcredit to layers of the population in need of funding. Guérin (2002) stated that microfinance is primarily a way of improving day-to-day life, by allowing households to overcome social dependency through the creation of income-generating activities. An example would be women engaged in agricultural and pastoral activities, who represent more than 55% of *MFI* members in the *WAMEU* zone. A comprehensive study by Mosley (2001) reported that only 11% of people benefiting from a microcredit program saw their revenues grow sustainably. Factors that could explain this state of affairs pertain to the growth of subsistence activities such as retail that cover a family's daily expenditure. To improve repayment rates, *MFIs* are required to monitor certain social variables such as the population of the area, the target clientele, socio-economic and cultural constraints, etc.

The rate of geographical coverage (defined as the ratio of *MFIs'* branches to the active population) of *MFIs* in Senegal is evolving less than proportionally to the population penetration rate (defined as the number of *MFIs'* customers to active population). It peaked at 14% in 2010, whereas the rate of penetration in the active population reached a maximum of 32% over the same period.

The *CGAP* defines a poverty line determined by the ratio of the average loan amount and *GDP* per capita, which should be less than 20%. Otherwise the targeted clientele is defined as non poor. According to Kumar (2011) and *CGAP* (1997), *MFIs* use indicators such as the scale of outreach and the depth of outreach to measure social reach. The scale of outreach can be measured by the number of clients served, the volume of savings available, the number of beneficiaries of microcredit, and the number of service points. The depth of outreach is measured by the socio-economic and cultural level of the clientele served, the population (rural, urban, poor and/or rich), gender (male/female), and income level (before and after obtaining credit). Lelart (2002), Waddock and Graves (1997) showed that microcredit does not always benefit the poorest households as intended, but rather a category of micro-entrepreneurs operating in *SMEs* and *SMIs* that does not have access to bank financing.

In Senegal, between 1980 and 2000, microcredit has been granted to a large proportion of poor households whose standard of living remains be-

low the 20% threshold. Targeting households with average standard of living is advantageous insofar as they have the potential repayment over the long term which helps to minimize the risk of default. This situation justifies credit risk management policies in *MFIs*, which coincides with our overall objective in this study. An empirical approach based on econometric methods will enable us to test the study's hypotheses on the Senegalese microcredit market.

3. METHODOLOGY AND EMPIRICAL MODELS

The objective is first, to develop an analytic model of the effects of a deterioration in the quality of the loan portfolio (translating into a positive default rate shock in the model) on variables determining financial and social performance; and second, to specify the most appropriate repayment policies to implement if a *MFI* faces a deterioration of the loan portfolio. The following hypotheses are tested:

- H1:** The social dimension significantly affects repayment policies over the long term.
- H2:** A positive default rate shock affects the financial and social performance variables in the long term.

3.1. Sampling and selection of variables

The study focuses on the microfinance sector in Senegal for the period from 1980 to 2010; the sample comprises 279 observations (aggregated value of 9 variables observed over 31 years). The sector is composed of savings and credit cooperatives, savings and credit groups, and approved savings and credit mutual benefit societies. The sample consists mainly of seven networks that include *MFIs* with more than 350 agencies on the Senegalese territory in 2009. These have to communicate regularly their financial information to the Central Bank of West African States (*CBWAS*) and the Ministry of the Economy and Finance.

The primary, mainly quantitative, data were obtained from the summary financial statements of the sector (microfinance unit at the Senegal Ministry of the Economy and Finance), monographs and annual reports (Department of microfinance *CBWAS*). This first stage of the data collection, allowed us, after processing and summarizing, to build a secondary database that was used for descriptive and econometric analysis. The data were divided into two groups, financial and social variables, in accordance with the study's objectives (see Table 1).

Table 1: Variables measuring the quality of portfolio at risk

| Measurement dimensions | Measurement variables | Dependent variables |
|-------------------------|--|---------------------|
| Financial (<i>PF</i>) | <ul style="list-style-type: none"> - Guarantee Fund (GFD) - Subsidy (SBV) - Volume of credits (VCR) | Default Rate (DFR) |
| Social (<i>PS</i>) | <ul style="list-style-type: none"> - Geographical proximity (GPX) - Standard of living (SFL) | |

The choice of these variables is based on the results of a study by Honlonkou et al. (2006) on the determinants of the repayment performance of *MFIs* in Benin. This study showed that the influence of variables such as savings, gender, tangible and intangible guarantees, purchasing power, standards of living and geographical proximity on the default rate was significant. These variables can be grouped into financial and social dimension. Default rate is a measure of the quality of the portfolio at risk. Using this relationship we elaborate an empirical analysis model based on VAR (Vector Auto-Regressive) methods and multiple regressions by Ordinary Least Squares (*OLS*), we measure the relationship between the default risk and social and financial performance variables. Then, the use of Granger causality tests and cointegration tests allows us to determine the relative influence between social and financial variables.

Then, the analysis of impulse functions allows us to measure the impact of a default rate shock on the financial and social variables. This shock is defined as an increase in the default rate above its normal value. In a normal situation, the quality of the *MFIs* portfolio at risk, expressed as the ratio between non-performing loans and outstanding loans, should be less than or equal to 5%. From this standard, we deduced an annual default rate that allowed us to determine the quality of the portfolio at risk.

3.2. Analytic models of shock effects on the default rate

In the analysis we use an empirical VAR (p^*) or Vector Autoregression model with (p) being the optimal lag number at time (t), giving:

$$Y_t = [(Default\ Rate)_t + (Financial\ Variables)_t + (Social\ Variables)_t] \quad (1)$$

$$Y_t = A_0 + A_1 Y_{t-1} + A_2 Y_{t-2} + \dots + A_p Y_{t-p} + \varepsilon_t \quad (2)$$

In Y_t which represents the endogenous variables, A_p represents constant vectors and ε_t is the structural shock vector. Past values of each variable ap-

pear in each equation of the VAR model. Thus we can test whether a variable or group of variables plays any role in determining other variables in the model. The lag number (p^*) is the value that minimizes the Akaike Information Criterion (AIC) and Schwarz Criterion (SC).

We deduce the following basic model:

$$Y_t = [(DFR)_t, (VCR)_t, (GFD)_t, (SBS)_t, (SFL)_t, (GPX)_t] \quad (3)$$

Through an estimate of OLS of the VAR (p) process we obtain the linear function in logarithmic form of the expression:

$$\begin{aligned} \text{Log}(DFR)_t = c + a_1\text{Log}(VCR)_t + a_2\text{Log}(GFD)_t + a_3\text{Log}(SBS)_t \\ + a_4\text{Log}(SFL)_t + a_5\text{Log}(GPX)_t + \varepsilon_t \end{aligned} \quad (4)$$

where ε_t is the error term; a_i are the coefficients to be estimated in the model in order to estimate the explanatory variables allowing the financial and social dimension variables to be measured; (DFR) is the dependent variable, designating the quality of the portfolio at risk. Through the VAR(p) model, analysis of the impulse functions allows us to identify the degree of impact of a deterioration in the loan portfolio (or higher default rate) on financial factors (default rate, volume of credits, guarantee funds) and social factors (subsidies, purchasing power and penetration rate).

4. MODELING, ANALYSIS OF RESULTS AND VERIFICATION OF HYPOTHESES

4.1. Modeling and econometric tests

We proceed in the elaboration of variables in first differences and the VAR model.

Variables in first differences: we first developed an analytic model of the long-term relationship between the variables of the study. The linear combination of the model is:

$$\begin{aligned} \text{Log}(DFR)_t = c + \alpha_1\text{Log}(VCR)_t + \alpha_2\text{Log}(GFD)_t + \alpha_3\text{Log}(SBS)_t \\ + \alpha_4\text{Log}(SFL)_t + \alpha_5\text{Log}(GPX)_t + \varepsilon_t \end{aligned}$$

The vector ($\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5$) is termed the cointegrating vector and (ε_t) is the residue obtained from the regression. The results of estimating the coefficients by OLS are presented as follows:

Table 2: Estimation of the long-term relationship by OLS

| Dependent Variable: LOG(DFR) | | | | |
|---|-------------|-----------------------|-------------|---------|
| Method: Least Squares Included observations: 31 Sample: 1980-2010 | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | 4.960170 | 3.080055 | 1.610416 | 0.1199 |
| LOG(VCR) | 0.914268 | 0.204735 | 4.465606 | 0.0001 |
| LOG(GFD) | -1.243341 | 0.254717 | -4.881270 | 0.0001 |
| LOG(SBS) | 1.138771 | 0.152964 | 7.444701 | 0.0000 |
| LOG(SFL) | -1.565960 | 0.721780 | -2.169580 | 0.0397 |
| LOG(GPX) | 0.845545 | 0.191021 | 4.426460 | 0.0002 |
| R-squared | 0.997663 | Mean dependent var | | 5.0262 |
| Adjusted R-squared | 0.997195 | S.D. dependent var | | 2.6164 |
| S.E. of regression | 0.138563 | Akaike info criterion | | -0.9429 |
| Sum squared residuals | 0.479996 | Schwarz criterion | | -0.6654 |
| Log likelihood | 20.61636 | F-statistic | | 2134.3 |
| Durbin-Watson stat | 1.153500 | Prob (F-statistic) | | 0.0000 |

The model is statistically significant overall (*Fisher probability* < 1% and $R^2 = 0.997$). The variables studied significantly affect the quality of the portfolio at risk of MFIs in the long term. However, the value of the correlation coefficient ($R^2 = 0.99$) is explained by the fact that the series are non-stationary. Stationarity of the residuals (ε_t) from the regression model is the main condition for accepting the hypothesis of cointegration of variables by comparing (*ADF or Augmented Dickey-Fuller*) and (*CV or Critical Value*). The hypothesis of stationarity of the model residuals (e_t) from the OLS regression is accepted because the estimated test statistic ($ADF = -3.609$) is less than the critical value ($CV = -3.573$) at 5% level (see results of the Dickey-Fuller Test on residuals in appendix 1). However, functions first difference will make possible to proceed to estimate the coefficients of a VAR process (p^*) by OLS. Writing the first difference model is presented as follows:

$$\begin{aligned}
 D(\log(DFR))_t &= C + a_1 D(\log(VCR))_t + a_2 D(\log(GFD))_t \\
 &\quad + a_3 D(\log(SBS))_t + a_4 D(\log(SFL))_t \\
 &\quad + a_5 D(\log(GPX))_t + \varepsilon_t
 \end{aligned}
 \tag{5}$$

(D) is the first difference operator defined by the function: $D(X_t) = X_t - X_{t-1}$.

The Augmented Dickey-Fuller test used to determine the stationarity of

the model variables and their order of integration. A comparison of the value of the statistic of Augmented Dickey-Fuller (*ADF*) and the Critics Value (*CV*) will accept the hypothesis of stationarity of a series at the 5% level.

These results show that the series in first difference $D(\log(DFR))$, $D(\log(VCR))$, $D(\log(GFD))$, $D(\log(SBS))$, $D(\log(SFL))$ and $D(\log(GPX))$ are stationary and integrated of order 1. The estimated statistical Dickey-Fuller (*ADF*) is less than the critical value (*CV*) at the 5% level for each series (default rate, volume of credit, grant, purchasing power and geographical proximity). Model variables are cointegrated at the 5% level (see results of the Johansen cointegration test, in appendix 2).

In the *VAR* (p^*) model, the number of lag (p^*) is the value that minimizes the Akaike Information Criterion terms (*AIC*) and Schwarz Criterion (*SC*). Results on the test criteria (*AIC*) and (*SC*) show that the optimal number of lag is 2 ($p^* = 2$), so we can develop a model *VAR* (2) to estimate by *OLS* as follows:

$$Y_t = A_0 + A_1 Y_{t-1} + A_2 Y_{t-2} + \varepsilon_t \quad (6)$$

The results show relatively significant levels of influence between financial variables and social variables regarding the management policies of the outstanding risk (see Table 3).

Influence of social variables on financial variables:

These results demonstrate that subsidies granted in previous years have a positive impact on the default rate, the supply of microcredit and guarantee funds. In other words, policies for the provision of microcredit, guarantee funds and improvement in the quality of the loan portfolio indirectly depend on previous subsidies received. The target clientele has a negative impact on the default rate, the supply of microcredit and guarantee funds. Geographical proximity impacts negatively on the default rate and positively on the provision of microcredit and guarantee funds.

Influence of financial variables on social variables:

The default rate has a positive impact on subsidies and geographical proximity. These can be influenced by the quality of the previous loan portfolio, whereas the target clientele is not, because it depends negatively on the default rate. The volume of credit negatively affects the targeted clientele and positively affects subsidies and geographical proximity. The latter can be affected by previous amounts of credit volume, whereas the purchasing power and standard of living of the targeted clientele are not.

Table 3: Estimation of the VAR (2) model

| Vector Autoregression Estimates (VAR) | | | | | | |
|--|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Included observations: 28 after adjusting endpoints; Sample(adjusted): 1983 2010 | | | | | | |
| Standard errors in () & t-statistics in [] | | | | | | |
| | <i>D</i> (LOG (DFR)) | <i>D</i> (LOG (VCR)) | <i>D</i> (LOG (GFD)) | <i>D</i> (LOG (SBS)) | <i>D</i> (LOG (SFL)) | <i>D</i> (LOG (GPX)) |
| <i>D</i> (LOG(DFR(-2))) | -0.0585 | 0.0539 | 0.0783 | -0.1207 | -0.0335 | -0.0063 |
| | (0.399) | (0.403) | (0.455) | (0.321) | (0.140) | (0.135) |
| | [-0.146] | [0.133] | [0.172] | [-0.375] | [-0.238] | [-0.047] |
| <i>D</i> (LOG(VCR(-2))) | 0.8337 | 1.5049 | 1.0673 | 0.9957 | 0.2297 | -0.1626 |
| | (0.695) | (0.702) | (0.793) | (0.559) | (0.244) | (0.235) |
| | [1.198] | [2.142] | [1.345] | [1.780] | [0.938] | [-0.690] |
| <i>D</i> (LOG(GFD(-2))) | -1.9382 | -2.2747 | -2.0674 | -1.9171 | -0.2461 | 0.1024 |
| | (0.622) | (0.629) | (0.710) | (0.500) | (0.219) | (0.210) |
| | [-3.111] | [-3.615] | [-2.910] | [-3.827] | [-1.123] | [0.485] |
| <i>D</i> (LOG(SBS(-2))) | 1.5304 | 1.3209 | 1.3868 | 1.5477 | 0.1229 | 0.0188 |
| | (0.500) | (0.505) | (0.571) | (0.402) | (0.176) | (0.169) |
| | [3.054] | [2.610] | [2.427] | [3.84224] | [0.697] | [0.111] |
| <i>D</i> (LOG(SFL(-2))) | -3.9682 | -6.2825 | -2.4880 | -2.027 | -0.9303 | 0.6346 |
| | (1.69) | (1.71) | (1.93) | (1.36) | (0.59) | (0.57) |
| | [-2.33] | [-3.66] | [-1.28] | [-1.48] | [-1.55] | [1.10] |
| <i>D</i> (LOG(GPX(-2))) | -0.5113 | 1.046 | 1.046 | 0.370 | -0.074 | -1.583 |
| | (1.086) | (1.097) | (1.238) | (0.85) | (0.382) | (0.367) |
| | [-0.470] | [0.953] | [0.845] | [0.42] | [-0.197] | [-4.306] |
| <i>C</i> | 0.2354 | 0.2976 | 0.2523 | 0.099 | 0.054 | 0.237 |
| | (0.159) | (0.160) | (0.188) | (0.12) | (0.056) | (0.053) |
| R-squared | 0.6152 | 0.643 | 0.638114 | 0.735 | 0.222 | 0.646 |
| Adj. R-squared | 0.3074 | 0.3589 | 0.348606 | 0.523 | -0.398 | 0.363 |
| Sum sq. resid | 0.414 | 0.422 | 0.538 | 0.267 | 0.051 | 0.047 |
| F-statistic | 1.998 | 2.259 | 2.204 | 3.474 | 0.358 | 2.286 |
| Log likelihood | 19.25 | 18.97 | 15.577 | 25.36 | 48.50 | 49.58 |
| Akaike AIC | -0.446 | -0.427 | -0.184 | -0.882 | -2.536 | -2.612 |
| Schwarz SC | 0.171 | 0.191 | 0.434 | -0.2643 | -1.917 | -1.994 |
| Mean dependent | 0.266 | 0.253 | 0.292 | 0.2857 | 0.046 | 0.165 |

4.2. Results and hypothesis analysis

We will proceed successively to the analysis of results and the verification of hypotheses 1 and 2. The use of Granger causality tests confirms the interaction between social and financial variables and at the same time allows our first hypothesis to be verified.

Granger causality tests and verification of the first hypothesis:

We know that (X_t) cause (Y_t) in the Granger sense if only we have:

$E(Y_t/Y_{t-1}, X_{t-1}) \neq E(Y_t/Y_{t-1})$. In other words, the predictability of (Y_t) is improved when the information on (X_t) is incorporated into the analysis. So it is better to know (X_t) to predict (Y_t) that without knowing it (Y_t does not cause X_t if probability $> 5\%$ and Y_t causes X_t if probability $> 5\%$). The results of the Granger causality test are given in Table 4 below.

Table 4: Granger causality test on MFI variables

| Pairwise Granger Causality Tests/MFI | | | |
|--|-----------|---------------------------|---------------------------|
| Sample: 1980-2010 Lags: 2 | | | |
| Null Hypothesis: | Obs | F-Statistic | Probability |
| <i>LOG(SFL) does not Granger Causes LOG(DFR)</i> <i>LOG(DFR) does not Granger Causes LOG(SFL)</i> | 29 | 0.64859 3.88766 | 0.53170 0.03447 |
| <i>LOG(SFL) does not Granger Causes LOG(VCR)</i> <i>LOG(VCR) does not Granger Causes LOG(SFL)</i> | 29 | 1.30493 5.46845 | 0.28975 0.01104 |
| <i>LOG(SFL) does not Granger Causes LOG(GFD)</i> <i>LOG(GFD) does not Granger Cause LOG(SFL)</i> | 29 | 1.13017 4.60746 | 0.33957 0.02026 |
| <i>LOG(GPX) does not Granger Causes LOG(SFL)</i> <i>LOG(SFL) does not Granger Cause LOG(GPX)</i> | 29 | 4.51764 0.76251 | 0.02162 0.47747 |

The results show that there are causal relationships between four pairs of variables:

“Default rate and client purchasing power”; “credit volume and client purchasing power”; “guarantee funds and client purchasing power”; “coverage rate and client purchasing power”.

For these pairs of variables the critical value of probability is less than 5%, which entails the rejection of the null hypothesis (non-causation) and acceptance of hypothesis $H1$ (causality between variables). This gives the following results.

The default rate Granger causes the clientele’s purchasing power. It is preferable to predict the repayment capacity of the client knowing the actual risk of default. Indeed, knowledge of the quality of the loan portfolio helps

determine the type of clientele to be targeted in providing microcredit, which consequently reduces probable losses.

The provision of microcredit Granger causes the clientele's purchasing power. It is preferable to estimate the client's repayment capacity knowing the volume of loans. Hence the provision of microcredit affects household's repayment capacity (purchasing power). Indeed, the availability of loanable funds enables MFIs to determine the type of clients able to benefit from them.

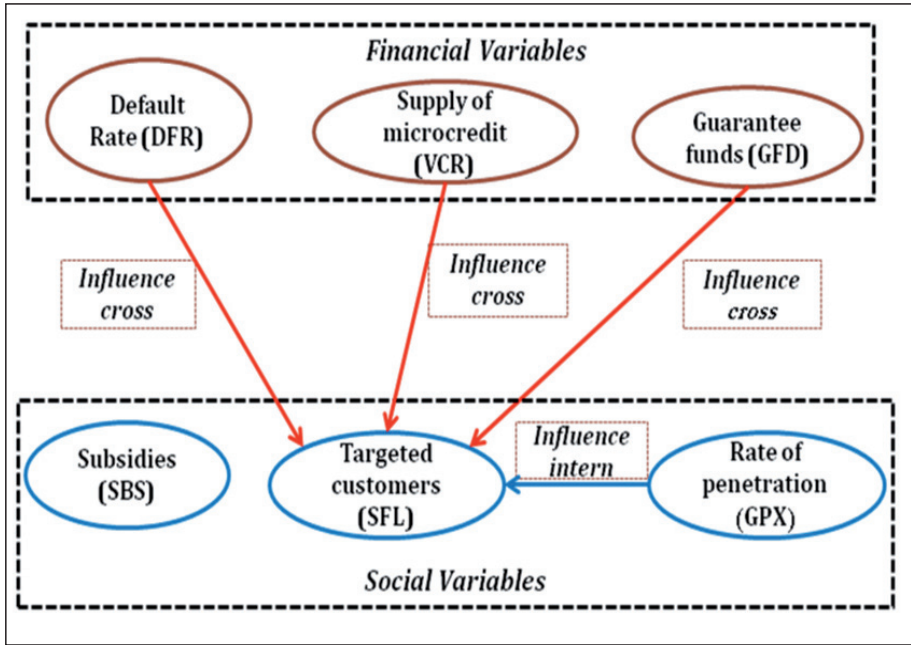
Guarantee funds Granger cause the purchasing power of the clientele. It is preferable to predict clients repayment capacity with knowledge of guarantee funds intended to compensate for probable losses than without knowledge of them. Indeed, the availability of guarantee funds enables MFIs to estimate the number of potentially creditworthy beneficiaries able to take out a loan.

Geographical proximity Granger causes clients purchasing power. It is preferable to estimate client's repayment capacity with knowledge of geographical proximity. Indeed, geographical proximity expressed in terms of the penetration rate and geographic coverage allows MFIs to predict the risk of non-repayment.

The results of Granger causality tests show that there is no causal relationship between financial variables, while with regard to social variables; only geographical proximity affects client's purchasing power. However, there is a cross-influence of financial variables (default rate, provision of microcredit and guarantee funds) on the social variable purchasing power (and the target clientele's repayment capacity). For microcredit repayment policies, it is preferable to estimate client's repayment capacity on the basis of current values of financial variables such as the default rate, the supply of microcredit and guarantee funds. Thus financial variables determine social variables in microcredit repayment policies. This situation is illustrated in Figure 1 below.

Hypothesis H1, according to which the social dimension significantly affects repayment policies in the long term, is disconfirmed. All financial variables significantly affect social variables but not the reverse (cross-influence). This performance is expressed in terms of the quality of the loan portfolio, the availability of loanable funds and the availability of guarantees to offset the risk of default. This finding corroborates the hypothesis of the institutionalism approach to microcredit, whereby *MFIs* should ensure good financial returns in order to sustain their microcredit operations for poor households (Morduch 2000; Lelart 2002; Pitt and Khandler 1998; Labie 1996). However, analysis of the effects of a positive impact on the interest rate can specify the financial and social performance variables allowing the quality of the portfolio to be improved.

Figure 1: Relative influence of social and financial variables

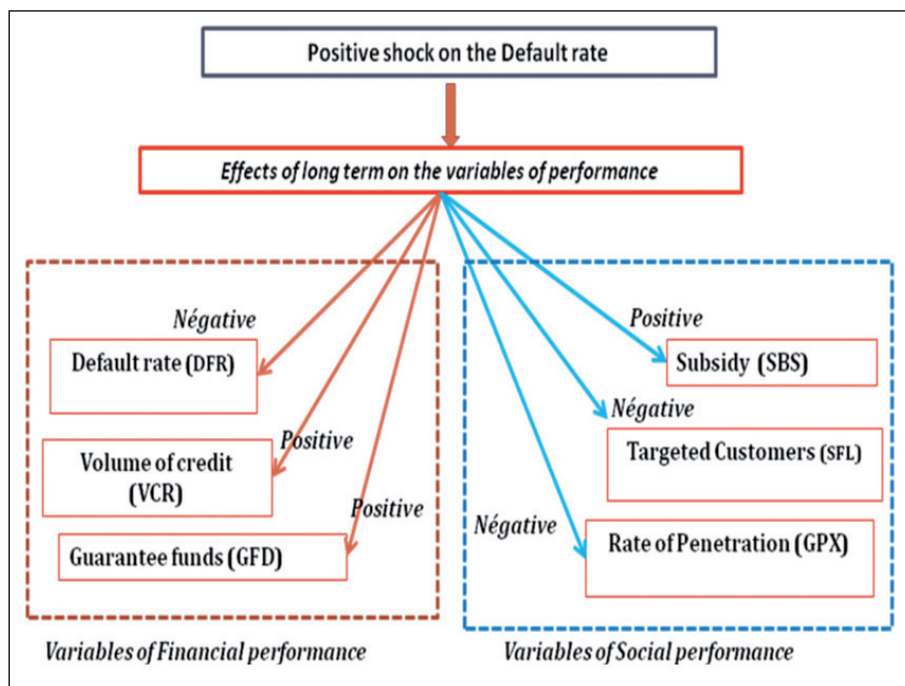


Effects of positive shocks on the default rate and verification of the second hypothesis

This method reflects the reaction over time to the variables of identified contemporary shocks. Thus, analysis of the response functions will enable us to clarify the impact of deterioration in the loan portfolio on financial and social performance variables. Appendix 3 shows simulations of the impact of deterioration in the loan portfolio from a positive impact on the default rate. The impact of deterioration in the loan portfolio (default rate) on financial performance variables (default rate, volume of credit, and guarantee funds) and social performance variables (subsidies, targeted customers and penetration rates) can cause an imbalance in the short, medium and long term. This situation is illustrated in Figure 2 below which shows the effects of a decline in the quality of the loan portfolio on the financial and social variables in the long run.

Thus we analyze the dynamic impulses of this impact over a time horizon of ten (10) periods, specified in the short [1, 3], medium [4, 6] and long term [7, 10].

Figure 2: Long-term effects of a positive impact on the default rate



Analysis of the effects of a default rate shock on financial performance variables:

A positive impact on the default rate results in similar effects on itself in the short and medium-term and negative effects in the long term. Indeed, an increase in the default rate leads to deterioration of the loan portfolio that will persist in the long term before a return to equilibrium. This applies to the current state of affairs regarding the quality of the portfolio at risk of MFIs in the Senegalese market, which has continued to deteriorate, especially in 2008, in response to the financial crisis.

A positive impact on the default rate has negative short-term effects on the supply of microcredit. However, in the medium term, there is stabilization in the credit supply before returning to its equilibrium level in the long term. A deterioration of the loan portfolio results in an increase in the supply of microcredit in the short and medium term. Indeed, the desired social objective in microcredit (improvement of households living conditions) means that MFIs tend to increase their provision of microcredit irrespective of clients creditworthiness because clients are covered by guarantee funds designed to absorb losses on loans.

A positive impact on the default rate has positive short-term effects on guarantee funds. The effect becomes negative in the medium term before returning to its equilibrium level in the long term. Thus a deterioration of *MFIs* loan portfolio leads to an increase, in the short term, of guarantee funds designed to compensate for losses on loans. But in the long term there is a reduction in guarantee funds, before returning to the desired level of equilibrium.

Effect of a positive default rate shock on social performance variables:

An increase in the default rate results in an increase in subsidies in the short term and a return to equilibrium in the medium term. But in the long term, there is an increase in the amount of subsidies. This situation is due to the efforts made by funders in terms of aid in kind and/or cash to support Senegalese *MFIs*.

A positive impact on the default rate results in similar effects on the targeted clientele (higher penetration rate) before returning to equilibrium. Indeed, in a situation of deterioration of the loan portfolio, *MFIs* continue to grant microcredit despite higher risk of default, which justifies the desired social objective of microcredit in developing countries.

A positive impact on the default rate has a stabilizing effect on the rate of geographic coverage in the short and medium term. However, this effect becomes negative in the long term, showing that a deterioration of the loan portfolio does not affect geographical proximity in the short and medium term. But in the long term, an increase in the default rate has a downward impact on the coverage rate in urban areas.

We see that in terms of financial performance variables an increase in the default rate leads to deterioration in the quality of the portfolio at risk, which will persist over the long term before returning to the desired equilibrium level. Indeed, in the long term, lower repayment rates (higher default rates) directly affect financial performance and, in turn, financial viability. On the other hand, in terms of social performance variables, a rising default rate does not affect the quality of the portfolio at risk in the long term.

CONCLUSION

Overall, in the long run, the social dimension does not significantly influence repayment performance. Deterioration in the loan portfolio has significant negative effects in the long term for financial performance indicators, but no significant effects on social performance indicators. This situation calls for non-repayment risk management policies that may take the form ei-

ther of guarantee funds to diversify risk (Lanha 2002) or solidarity credit to reduce information asymmetry. In Senegal, despite a socially significant presence of *MFI*s in income-generating activities, financial viability is a prerequisite for the sustainability of microcredit activities, especially in recent years, which corroborates studies by supporters of institutionalist microcredit school.

These results should enable microfinance actors to better understand, as the provision of microcredit in developing countries becomes increasingly widespread, the factors encouraging repayment of microcredit that allow social and financial objectives to be attained. Similarly, these results will enable different policies for managing defaults to be controlled in the market specifically comprising poor households excluded from the traditional banking system (Ndour 2011).

However, it should be noted that our results must be nuanced because of problems met in the time notice given to have a look at the database and recorded papers at the Ministry of Finance. Similarly, the lack of certain financial statements with respect to the period of study has led to the use of annual consolidated data insofar as the average loan term is one year. These limits have influenced the composition of the sample and statistical analysis methods (*VAR* model). In addition, the number of observations is low, which affects the results.

Although not exclusive, this study is not without possible extension, especially in matters relating to methods of assessing credit risk in the image of commercial banks through a rating system for *MFI*s in developing countries. This study could be extended to the *MFI* level of *WAMEU* zone, allowing a better understanding of the determinants of credit risk.

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APPENDICES

Appendix 1: *The Dickey-Fuller Augmented Test on the model Residuals*

| | | | | |
|---|-------------|--------------------|-------------|--------|
| ADF Test Statistic | -3.609833 | 1% Critical Value* | -4.3082 | |
| | | 5% Critical Value | -3.573 | |
| | | 10% Critical Value | -3.2203 | |
| <p>* MacKinnon critical values for rejection of hypothesis of a unit root. Augmented Dickey-Fuller Test Equation Dependent Variable: D(RESID01) Method: Least Squares Included observations: 29 after adjusting endpoints Sample(adjusted): 1982- 2010</p> | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| RESID(1) | -0.776487 | 0.215103 | -3.609833 | 0.0013 |
| D(RESID(-1)) | 0.281045 | 0.192004 | 1.463742 | 0.1557 |
| C | -0.019907 | 0.047683 | -0.417487 | 0.6799 |
| @TREND(1980) | 0.000991 | 0.002648 | 0.374321 | 0.7113 |

Appendix 2: *The Johansen Cointegration Test*

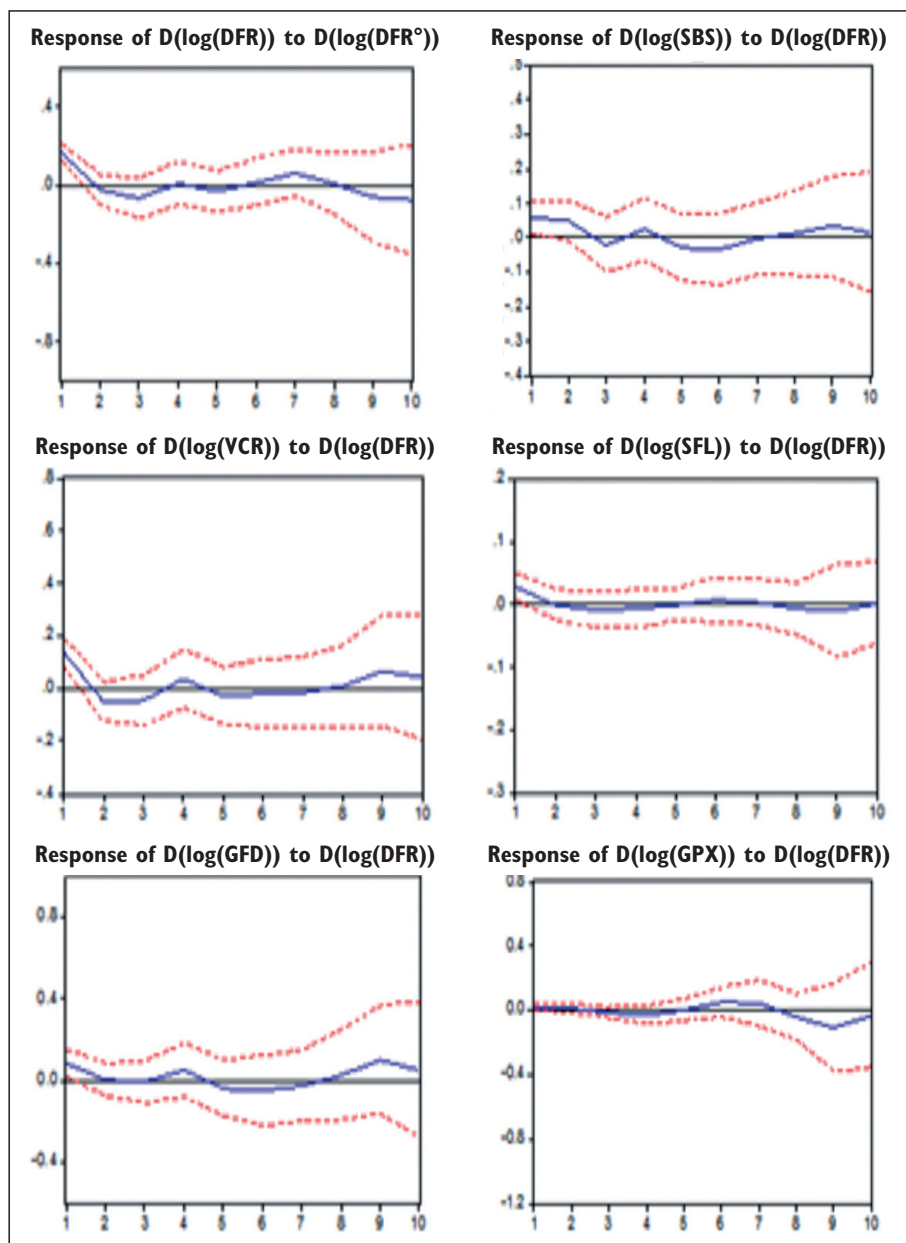
| <p>Included observations: 29 after adjusting endpoints Trend assumption: No deterministic trend Series: LOG(DFR) LOG(VCR) LOG(GFD) LOG(SBS) LOG(SFL) LOG(GPX) Lags interval (in first differences): 1 to 1 Unrestricted Cointegration Rank Test Sample(adjusted): 1982- 2010</p> | | | | |
|---|------------|-----------------|--------------------------|--------------------------|
| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 5 Percent Critical Value | 1 Percent Critical Value |
| None ** | 0.88527 | 131.04 | 82.49 | 90.45 |
| At most 1 ** | 0.59308 | 68.254 | 59.46 | 66.52 |
| At most 2 * | 0.50531 | 42.179 | 39.89 | 45.58 |
| At most 3 | 0.38825 | 21.768 | 24.31 | 29.75 |
| At most 4 | 0.19531 | 7.5166 | 12.53 | 16.31 |
| At most 5 | 0.04102 | 1.2148 | 3.84 | 6.51 |

*(**) denotes rejection of the hypothesis at the 5%(1%) level

Trace test indicates 3 cointegrating equation(s) at the 5% level

Trace test indicates 2 cointegrating equation(s) at the 1% level

Appendix 3: Effect of a positive default rate on repayment factors



Résumé

L'article met l'accent sur le portefeuille à risque des institutions de microfinance (IMF). L'étude vise à évaluer l'effet d'une variation des prêts sur la performance financière et sociale; et de spécifier les politiques de remboursement appropriées dans la gestion du portefeuille. Les données (1980-2010) sont recueillies auprès des IMF sénégalaises. Les modèles VAR et les fonctions d'impulsion ont servi d'analyse des hypothèses. Les résultats montrent un niveau d'influence significatif des variables financières par rapport aux variables sociales, ce qui indique que la dimension financière reste déterminante dans la gestion du risque de crédit.

Mot clés: Microcrédit, Impayé, Risque, Performances financière et sociale.

JEL: C51, G32, P27

