

AGRICULTURAL CREDIT RISK AND ITS MACROECONOMIC DETERMINANTS

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Abstract. Agricultural credit plays an important role in supporting farm production, agricultural investment, rural employment, and food security. However, lending to the agricultural sector involves specific risks arising from production uncertainty, seasonal income patterns, market price fluctuations, and borrowers' exposure to adverse economic conditions. Macroeconomic instability may further affect farmers' repayment capacity and the quality of agricultural loan portfolios. This study aims to examine the macroeconomic determinants of agricultural credit risk, focusing on economic growth, inflation, exchange rate movements, unemployment, and agricultural production growth. Agricultural credit risk is proposed to be measured using the non-performing loan (NPL) ratio for agricultural loans. The research adopts a quantitative approach based on secondary data obtained from official statistical and financial institutions, subject to data availability. A multiple regression model is proposed to investigate the relationships between the selected macroeconomic indicators and agricultural credit risk. The study also considers the potential implications of agricultural credit risk for financial stability, farm investment, and sustainable agricultural development. The expected contribution is a sector-specific analytical framework that connects macroeconomic conditions with agricultural lending performance. The direction and magnitude of the relationships will be established through empirical analysis rather than assumed in advance. The practical implications may support agricultural credit risk assessment, early-warning systems, and evidence-based lending policies.

Keywords: agricultural credit risk, agricultural finance, non-performing loans, macroeconomic determinants, agricultural production, credit risk management.

Аннотация. Сельскохозяйственное кредитование играет важную роль в поддержке аграрного производства, инвестиций в сельское хозяйство, занятости в сельской местности и обеспечении продовольственной безопасности. Однако кредитование аграрного сектора сопряжено со специфическими рисками, обусловленными неопределенностью производственных результатов, сезонным характером доходов, колебаниями рыночных цен и уязвимостью заемщиков к неблагоприятным экономическим условиям. Макроэкономическая нестабильность может дополнительно влиять на платежеспособность фермеров и качество кредитных портфелей в аграрном секторе. Цель данного исследования — анализ макроэкономических детерминант кредитного риска в сельском хозяйстве с акцентом на такие факторы, как экономический рост, инфляция, динамика валютных курсов, уровень безработицы и темпы роста сельскохозяйственного производства. Для оценки кредитного риска в аграрном секторе предлагается использовать показатель доли проблемных кредитов (NPL). В работе применяется количественный подход, основанный на вторичных данных официальных статистических и финансовых ведомств (с учетом их доступности). Для изучения взаимосвязи между выбранными макроэкономическими показателями и кредитным риском в сельском хозяйстве предлагается использовать модель множественной регрессии. Также рассматриваются возможные последствия кредитного риска в аграрном секторе для финансовой стабильности, инвестиционной активности фермерских хозяйств и устойчивого развития сельского хозяйства. Ожидаемым результатом исследования является разработка отраслевой аналитической модели, связывающей макроэкономические условия с показателями эффективности кредитования сельского хозяйства. Направление и сила выявленных взаимосвязей будут определены в ходе эмпирического анализа, а не заданы априори. Практическая значимость работы заключается в возможности использования ее результатов для совершенствования оценки кредитных рисков, создания систем раннего предупреждения и формирования обоснованной политики кредитования.

Ключевые слова: кредитный риск в сельском хозяйстве, финансирование сельского хозяйства, проблемные кредиты, макроэкономические детерминанты, сельскохозяйственное производство, управление кредитным риском.

1. Introduction

Agriculture plays an important role in economic development by supporting food security, rural employment, and agricultural investment. Access to credit enables farmers to purchase inputs, adopt modern technologies, and improve productivity (FAO, 2024). However, agricultural lending involves specific financial risks due to seasonal income patterns, production uncertainty, and fluctuations in agricultural commodity prices (Johnson et al., 2017).

Macroeconomic conditions may further influence agricultural borrowers' repayment capacity. Inflation can increase production costs, while exchange rate depreciation may raise the prices of imported agricultural inputs and machinery. Economic growth and changes in market demand may also influence farm revenues and the ability of borrowers to meet their financial obligations. Nevertheless, empirical evidence suggests that farm-level and agricultural-sector indicators may be more reliable predictors of agricultural credit risk than macroeconomic variables alone (Johnson et al., 2017).

This study aims to examine the macroeconomic determinants of agricultural credit risk, focusing on economic growth, inflation, exchange rate movements, unemployment, and agricultural production growth. Using a quantitative research framework, the study proposes to analyse the relationship between these indicators and the non-performing loan ratio for agricultural loans, subject to data availability.

The study contributes to agricultural economics research by connecting macroeconomic conditions with agricultural credit risk management. Its findings may provide useful insights for financial institutions and policymakers seeking to improve agricultural lending practices and support sustainable agricultural development.

2. Literature Review and Research Methodology

Previous research has highlighted the importance of both macroeconomic conditions and farm-specific characteristics in determining agricultural credit risk. Johnson et al. (2017), using data from 153 grain farms, found that farm-level financial indicators and agricultural-sector variables were more informative in explaining changes in credit quality than broad macroeconomic indicators alone. Their findings suggest that agricultural credit risk analysis should consider the financial characteristics of farms alongside general economic conditions.

Similarly, Muhović et al. (2019) investigated the determinants of non-performing agricultural loans in Serbia, Montenegro, and Bosnia and Herzegovina. Their research emphasised the importance of analysing agricultural lending through sector-specific data and appropriate econometric methods. Research on agricultural finance also indicates that access to credit can support investment, technology adoption, and productivity, although barriers to financial services remain important for farmers and rural enterprises (FAO, 2024).

Despite these contributions, the relationship between macroeconomic conditions and agricultural credit risk remains context-dependent. Inflation, economic growth, exchange rate movements, and unemployment may influence borrowers' repayment capacity through changes in production costs, income, market demand, and financing conditions. However, farm profitability, liquidity, and production performance may also explain variations in loan quality (Johnson et al., 2017).

To illustrate these relationships, the present study proposes a quantitative framework in which agricultural credit risk is measured by the non-performing loan (NPL) ratio for agricultural loans. The explanatory variables include real GDP growth, inflation, exchange rate movements, unemployment, and agricultural production growth. Multiple linear regression is selected as an introductory

econometric method because it allows the association between several explanatory variables and agricultural credit risk to be examined simultaneously.

The proposed model is expressed as follows:

$$NPL_t = \beta_0 + \beta_1 GDP_t + \beta_2 INF_t + \beta_3 EXR_t + \beta_4 UNEMP_t + \beta_5 AGR_t + \varepsilon_t$$

where

NPL_t- represents the agricultural non-performing loan ratio;

GDP_t- is real GDP growth;

INF_t- is the inflation rate;

EXR_t- represents the exchange rate;

UNEMP_t- denotes the unemployment rate;

AGR_t- represents agricultural production growth;

and ε_t is the error term.

Based on economic theory, GDP growth and agricultural production growth are expected to be negatively associated with agricultural credit risk, while inflation and unemployment may be positively associated with the NPL ratio. Exchange rate movements may have either positive or negative associations, depending on farmers' exposure to imported inputs, export revenues, and currency fluctuations. These expected relationships are hypotheses to be tested rather than established empirical findings.

For educational purposes, the regression procedure can be demonstrated in STATA using a simulated dataset. The illustrative results are intended to explain coefficient interpretation and basic statistical inference; they do not represent actual estimates for any country. In a real empirical study, the model would require consistent sector-specific loan data, a clearly defined observation period, and appropriate diagnostic tests. Furthermore, the estimated coefficients would indicate statistical associations rather than necessarily demonstrating causal effects.

3.1. Illustrative Regression Results

To demonstrate the application of multiple linear regression, a simulated dataset is assumed for educational purposes. The following table presents an illustrative example of how the estimated coefficients may be interpreted. The figures are hypothetical and must not be treated as actual empirical evidence.

Table 1. Illustrative OLS regression results

Variable	Coefficient	Expected sign
GDP growth	-0.35	-
Inflation	0.16	+
Exchange rate depreciation	0.02	±
Unemployment	0.24	+
Agricultural production growth	-0.28	-
Constant	7.50	—

Source: Author's illustrative example using hypothetical coefficients.

The illustrative coefficients suggest that economic growth and agricultural production growth may be associated with lower agricultural credit risk. In contrast, inflation and unemployment may be associated with higher NPL ratios. The exchange rate coefficient is positive in this example, potentially reflecting increased costs for agricultural borrowers exposed to imported inputs. However, statistical significance cannot be inferred from coefficient estimates alone; standard errors, p-values, and diagnostic tests would be required.

The model is designed to demonstrate how macroeconomic analysis can be applied to agricultural finance. A real empirical investigation would need to estimate the coefficients using observed data and test whether the proposed relationships are supported statistically.

4. Discussion and Policy Implications

Agricultural credit risk is closely related to the financial conditions of farmers and the broader macroeconomic environment. The proposed model provides a framework for examining how economic growth, inflation, exchange rate movements, unemployment, and agricultural production growth may be associated with the repayment performance of agricultural loans. However, the actual strength and statistical significance of these relationships must be established using reliable empirical data.

Economic growth may improve agricultural credit quality by supporting market demand, employment, and business revenues. In contrast, rising inflation can increase the cost of seeds, fertilizers, fuel, and agricultural machinery, placing additional pressure on farm profitability. Exchange rate depreciation may create further difficulties for farmers who depend on imported inputs, although its effects may differ for agricultural producers who benefit from export revenues. Agricultural production growth may improve borrowers' repayment capacity, while adverse production outcomes can increase financial vulnerability.

These relationships have several implications for agricultural finance. First, banks should incorporate agricultural production cycles, farm income patterns, and macroeconomic indicators into credit risk assessments. Second, financial institutions could strengthen early-warning systems to identify borrowers who may experience repayment difficulties during periods of rising input costs or declining agricultural output. Third, policymakers should promote access to appropriate agricultural financial products, including repayment schedules aligned with harvest periods. Finally, improving the availability and transparency of agricultural lending data would support more reliable credit risk assessment and evidence-based policy development.

The proposed framework should nevertheless be interpreted with caution. Macroeconomic indicators alone may not capture important factors such as weather conditions, farm size, collateral availability, loan maturity, and individual borrower characteristics. Consequently, a comprehensive assessment of agricultural credit risk should combine macroeconomic analysis with farm-level financial information. The practical effectiveness of the recommendations will depend on the findings of future empirical research.

5. Conclusion and Recommendations

This study proposes a framework for examining the macroeconomic determinants of agricultural credit risk. It focuses on economic growth, inflation, exchange rate movements, unemployment, and agricultural production growth as potential factors associated with the non-performing loan ratio for agricultural loans. The study highlights the importance of understanding agricultural credit risk within the broader context of agricultural economics and rural financial development.

The proposed econometric model provides an introductory method for analysing the relationships between macroeconomic conditions and agricultural loan performance. However, the illustrative regression results are based on hypothetical data and cannot be interpreted as actual findings. Reliable conclusions require consistent agricultural lending statistics, appropriate econometric estimation, and diagnostic testing.

Several recommendations follow from the proposed framework. Banks should strengthen the monitoring of agricultural borrowers and consider seasonal income patterns when designing repayment schedules. Policymakers should improve the availability of sector-specific credit data and support financial products suited to agricultural production cycles. Furthermore, future research should incorporate farm-level financial indicators, weather conditions, and agricultural commodity prices to provide a more comprehensive assessment of agricultural credit risk.

In conclusion, analysing the relationship between macroeconomic conditions and agricultural credit risk can contribute to a better understanding of the financial challenges facing agricultural producers. A more comprehensive, data-driven approach may help improve agricultural lending practices, strengthen financial risk management, and support sustainable agricultural development.

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